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ABSTRACT

This competency-based program guide provides course content information and procedures for secondary schools, postsecondary vocational schools, and community colleges in Florida that conduct programs in basic marine mechanics and marine mechanics. The first section is on legal authority, which applies to all vocational education programs in Florida. The second section describes the content of the two types of marine mechanics programs, including occupational descriptions, program standards description, competencies, curriculum frameworks and student performance standards for each occupation, instructional approach, course outline and sample lesson plan, and information on student organizations. In the third section, student admission requirements and teacher certification and qualifications are spelled out, while the fourth section provides information on facilities and supplies for the marine mechanics curriculum. The final section lists instructor resources (both printed and audiovisual materials), and professional organizations and support services. Appendixes to the guide contain a diagram of facilities needed for the program and an organization chart for the student organization, Vocational Industrial Clubs of America. (KC)

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ED268269

PROGRAM GUIDE
FOR

BASIC MARINE MECHANICS
8751000 (IN49.032600)

AND

MARINE MECHANICS
MTE0991 (IN47.030600)

Prepared by

Department of Adult & Vocational Education
College of Education
University of South Florida
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Bureau of Vocational Program and Staff Development
Division of Vocational, Adult, and Community Education

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INTRODUCTION

This Program Guide has been developed to provide information that will be useful tc local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibilty of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

The Legal Authority sections of the Guide relate to vocational education programs in general. The remaining sections relate specifically to the vocational education program course for which the Guide is designed.

Vocational education has evolved to meet the needs of students desiring to pursue a selected vocation. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. In order to do this, it is necessary both to create exemplary vocational programs and to make those programs consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship between Florida institutions offering similar or related courses and programs. The rule states, in part, that:

> When a student tranfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged ... to be equivalent to courses offered at the receiving institution.

This Program Guide helps ensure that equivalency. Throughout Florida, vocational programs, if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

LEGAL AUTHORITY

Program Standards

Vocational education programs are established pursuant to Florida Statutes (hereafter F.S.) and enabling Administrative Rules adopted by the Florida State Board of Education (hereafter S.B.E.).

Section 233.0682 F.S.: State Board regulations states:

> The State Board of Education shall adopt regulations setting forth minimum requirements for a comprehensive vocational education program, and shall adopt procedures for determining the extent to which such minimum requirements are being met. Such requirements shall include examination of the employment performance of program participants as well as standards of educational output, with particular emphasis on job placement and satisfactory performance in employment.

This statute is administered by S.B.E. Administrative Rule 6A-6.21: Comprehensive Vocational Education Program; definition, which states, in part, that:

> the term comprehensive vocational education shall include occupational education programs not leading to a bachelor's degree. A comprehensive vocational education program is one which provides vocational programs, services and activities of high quality, realistic in light of actual or anticipated opportunities for gainful employment and suited to the needs, interests, and abilities of the persons to be served.

For the purpose of defining the vocational education programs administered by community colleges within the state, the Division of Community Colleges has adopted S.B.E. 6A-14.34 to implement 240.355 F.S.: State Board of Education Rules, which authorizes "each community college district board of trustees to initiate and provide comprehensive vocational education programs." (NOTE: S.B.E. Rule 6A-14.34 is identical to S.B.E. Rule

6A-6.621 [see above], except that all S.B.E. Chapter 6A-14 rules refer to Division of Community College-sponsored programs, while S.B.E. Chapter 6A-6 rules refer to programs sponsored by the Division of Vocational, Adult, and Community Education.)

S.B.E. Rule 6A-6.571: Criteria for qualification of special vocational-technical education program courses provides for the annual publication of Vocational Education Program Courses Standards. These course standards for each vocational education program are approved by the Florida State Board of Education and published by the Division of Vocational, Adult, and Community Education.

The Program Course Standards provide program descriptions and statements of program objectives that must be adhered to by the school districts in offering vocational programs. The extent to which these Standards are adhered to forms the basis for program review and evaluation.

Special funding provisions for vocational programs are determined in relation to all other education programs under Section 236.081 F.S.: Funds for the operation of schools.

Program Planning

The Vocational Education Planning Process, published in 1980 by the Division of Vocational Education, outlines the procedures local education agencies should follow in developing and submitting their five-year and annual plans for the operation of vocational education programs.

The legal basis for program planning is found in Section 229.55 F.S.: Educational Accountability Act of 1976, and 299.555 F.S.: Educational planning and information systems. These statutes address various aspects of the process of planning effective instructional programs at each level—

from the local school district to the state level. These Florida Statutes are implemented by S.B.E. 6A-6.67: Coordinating Council for vocational education, adult general education, and community instructional services, S.B.E 6A-6.70: Direct job-related vocational offerings required for each school district, and S.B.E. 6A-6.71: Student services.

School districts are encouraged to utilize the resources and support of business, industry, and the community in planning vocational programs. A portion of S.B.E. Rule 6A-6.67, which has particular implications for planning for specific vocational programs in specific schools, follows:

> The responsibilities of the [coordinating] council shall be to review the total vocational education, adult general education, and community instructional services program being offered in the district, to make such recommendations as are necessary, to encourage the development of needed offerings or changes in existing offerings and to avoid unwarranted duplications.

(S.B.E. Rule 6A-14.37 addresses this topic in identical language for community college programs.)

Program Structure

The legal basis for Florida's comprehensive vocational education structure may be found in S.B.E. Rules 6A-6.621 and 6A-14.34: Comprehensive vocational education, definition; 6A-6.63 and 6A-14.343: Scope of vocational education; 6A-6.64 and 6A-14.344: Types of vocational education courses and activities; and 6A-6.65 and 6A-14.345: Instructional components of vocational education.

Perhaps the legal basis for Florida's comprehensive vocational program is stated best in S.B.E. Rules 6A-6.65 and 6A-14.345. These rules define the components of vocational education instruction, beginning with introduction to the world of work in grades 1-6; exploratory experiences in grades 7-9; job-related experiences and prevocational training instruction

in grades 10-12; and adult-level training and retraining programs. Special needs of disadvantaged and handicapped individuals at all levels—grade 1 through adults—are considered and provided for. Based upon these rules, Florida has developed a statewide comprehensive vocational program that is recognized as one of the best in the nation.

Program Development

Vocational program development is geared to meet the needs of Florida's employers and students. The vocational planning process incorporates information from business and industry, including data on employers' needs and on emerging trends and changes in technological processes. Legal basis is provided by S.B.E. Rules 6A-6.64 and 6A-14.344, both entitled Types of vocational education courses and activities, for the development of the many vocational courses and programs that must be offered to meet the needs of employers and students. These rules will be amended in the future to bring them more into conformity with 1983 legislation.

Section 228.041 F.S. defines vocational education as follows:

> (22) "Vocational education" is defined as meaning that instruction not leading to a baccalaureate degree, either graded or ungraded, listed below:
>
> (a) Job-preparatory instruction in the minimum competencies necessary for effective entry into an occupation, including diversified cooperative education, work experience, and job entry programs which coordinate directed study and on-the-job training;
>
> (b) Exploratory courses designed to give students initial exposure to the skills and aptitudes associated with a broad range of occupations in order to assist them in making informed decisions regarding their future academic and occupational goals;

(c) Supplemental programs designed to enable persons who are or have been employed in a specific occupation to upgrade their competencies in order to re-enter or maintain stability or advance within their occupation; or

(d) Practical arts courses designed to teach students practical generic skills which, though applicable to some occupations, are not designed to prepare students for entry into specific occupations. Such courses may include, but may not be limited to, typing, industrial arts, and home economics.

Program development is based largely on identifying and meeting the requirements of employers and credentialling agencies. Significant input is sought from advisory groups, ad hoc committees, and task forces made up of representatives from business and industry and instructional, supervisory, and administrative personnel. The Division of Vocational, Adult, and Community Education, the school districts, and community colleges work together to develop programs with objectives that are consistent with employers' requirements.

Educational standards are established for program development. Using these standards as guides and guidelines, effective programs are developed that meet the goals of vocational education, particularly the major goal of preparing students for entry-level employment. These standards are grouped into three categories: input, process, and product. First, standards of input govern requirements for teachers, facilities, and materials. Second, standards of process help determine requirements for instruction, curriculum selection, placement, and evaluation. And third, standards of product are determined by the number and degree of competencies students achieve and by the placement of trained students in jobs.

Program Review and Evaluation

The primary purpose of program review is program improvement. To accomplish this purpose, a review of each vocational program is necessary to determine those areas in which program improvement can be implemented most effectively.

The legal basis for program review is found in Chapter 229.565 F.S. Educational evaluation procedures. Section (3)(e) of that statute requires the Commissioner of Education to periodically examine and evaluate "the standards by which the school district evaluates basic and special programs for quality, efficiency, and effectiveness."

The term "special programs," as used here, includes vocational programs. In turn, under S.B.E. Rule 6A-1.453: Educational program audits, the Commissioner directs the Division to examine and evaluate vocational programs.

S.B.E. Rule 6A-1.453 provides for periodic audits of both the accounts and programs of each school district. It states in part that the Division shall be responsible for examination of vocational education programs to:

a. Determine compliance with law and criteria established by rules of the State Board;

b. Ensure that individual courses use instructional objectives which are consistent with the criteria for qualification of individual courses as outlined in the publications titled, "Vocational Education Program Courses Standards," Rule 6A-6.571, FAC; and

c. Determine that the capability exists in the instructional setting to accomplish the course objectives.

Under this same rule, the Division also is responsible for: "Examination of adult and community education programs to determine compliance with law and criteria established by rules of the State Board" and "determination of the existence and comprehensiveness of the criteria

based on district goals, by which the school district evaluates vocational education and adult general education programs."

The Vocational Education Program Courses Standards (and the new Curriculum Frameworks) provide program descriptions and objectives that may be used as criteria against which the program may be reviewed and evaluated. Basically, program review consists of a self-study by the staff of the program to be reviewed, a visitation and review by a Division staff member, a final report outlining areas of strengths and weaknesses, and a plan for strengthening weaknesses and/or improving the program. The data from the program review instruments are treated statistically and incorporated into the evaluation system.

Program Advisory Committees

Program advisory committees are mandated by federal (Public Law 90-576) as well as state regulations. A single State Advisory Council is provided for in S.B.E. Rule 6A-6.75: Advisory Council for Vocational Education. Committees for individual programs are covered under S.B.E. Rule 6A-6.74: Duties and responsibilities, which states that the director of the Division of Vocational, Adult, and Community Education shall "direct the work of the Division to insure the greatest possible coordination, efficiency and effectiveness in vocational and technical education in the state." The Division encourages program advisory committees as a means of fulfilling this mandate.

The Division utilizes a number of advisory committees in addition to those required by law. Each program area—Agribusiness and Natural Resources, Business, Diversified Occupations, Health Occupations, Home Economics, Industrial, Marketing and Distributive, and Public Service

Education—has a corresponding state advisory committee. Also, many general advisory committees have been formed to deal with special programs and problems.

Several advisory committees assist school districts and community colleges with vocational program planning and operation. The legal basis for such use of advisory committees may be found in S.B.E. Rules 6A-6.68 and 6A-14.38, both entitled Business and industrial community support. These rules state that school boards and boards of trustees at all levels should take positive steps (which are enumerated) to establish two-way communications and mutual responsiveness between their institution's vocational education program system and the surrounding business and industrial community.

These rules are responsive to the fact that in program development, implementation, and evaluation it is especially important that advisory committees be effectively utilized at the state and local levels. Community resources are an important part of vocational program development.

DESCRIPTION OF THE OCCUPATION

This Competency Based Program Guide provides course content information and procedures for secondary, postsecondary vocational schools, and community colleges, conducting programs in the occupational area of Basic Marine Mechanics and Marine Mechanics.

The Federal Dictionary of Occupational (D.O.T.) Job Titles identifies this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Marine Mechanic, Deck Engineer	(623.281-010)
Machinist Apprentice, Outside	(623.281-022)
Machinist, Outside	(623.281-030)
Maintencance Mechanic, Engine	(623.281-034)
Marine Engine Mechanic	(623.281-026)
Outboard Motor Mechanic	(623.281-042)
Motor Boat Mechanic Helper	(623.684-010)
Boat Rigger	(806.464-010)

The definition (description) for each of these job titles is abstracted from the D.O.T. for easy reference.

Marine Mechanic, Deck Engineer (623.281-010)
Repairs and maintains deck machinery, such as cargo winches and anchor windlasses: Operates machinery to determine causes of malfunctioning. Dismantles, repairs, or replaces defective parts, and reassembles machinery,

using machinist's handtools, chain hoists, and steel rollers. May maintain ship's plumbing system. May change fuses and lights and overhaul electric motors. Rating must be endorsed by U.S. Coast Guard.

Machinist Apprentice, Outside (623.281-022)

A worker who learns, according to written or oral contractual agreement, a recognized skilled craft or trade requiring one or more years of on-the-job training through job experience supplemented by related instruction, prior to being considered a qualified skilled worker. High school or vocational school education is often a prerequisite for entry into an apprenticeship program. Provisions of apprenticeship agreement regularly include length of apprenticeship; a progressive scale of wages; work processes to be taught; and amount of instruction in subjects related to the craft or trade, such as characteristics of materials used, physics, mathematics, estimating, and blueprint reading. Apprentice ability of a particular craft or trade is best evidenced by its acceptability for registration as a trade by a State apprenticeship agency or the Federal Bureau of Apprenticeship and Training. Generally, where employees are represented by a union, apprenticeship programs come under the guidance of joint appreticeship committees composed of representatives of the employers or the employer association and representatives of the employees. These committees may determine need for apprentices in a locality and establish minumum apprenticeship standards of education, experience, and training. In instances where committees do not exist, apprenticeship agreement is made between apprentice and employer, or an employer group. The title, Apprentice, is often loosely used as a synonym for beginner. This practice is technically incorrect and leads to confusion in determining what is meant.

Machinist, Outside (623.281-030)

Installs ship machinery, such as propelling machinery, auxiliary motors, pumps, ventilating equipment, and steering gear, working from blueprints and using handtools, calipers, and micrometers. Lays out passage holes on bulkheads, decks, and other surfaces for connections, such as shafting and steam lines. Installs below-deck auxiliaries, such as evaporators, stills, heaters, pumps, condensers, and boilers and connects them to steampipe systems. Tests and inspects installed machinery and equipment during dock and sea trials. May set up and operate such machine shop tools as lathe, boring mill, planer, shaper, slotter, and milling machine to fabricate replacement parts.

Maintenance Mechanic, Engine (623.281-034)

Repairs and maintains propulsion engines and other engines and engine parts aboard ship: Examines engine equipment, such as pumps, circulators, condensers, and steering engines to locate malfunctions, and dismantles and repairs defective equipment, using handtools and power tools. Makes engine replacement parts such as slide valves, stay rods, and bolts, using metalworking machinery. Stand engineroom watch during specified periods, observing gages to determine that operating conditions, such as temperatures, steam pressure, water and oil levels, and revolutions per minute are within specified ranges. Adjusts controls to maintain specified operating conditions. Records gage readings in engineeering log. Must be licensed by U.S. Coast Guard.

Marine Engine Mechanic (623.281-026)

Installs and repairs gasoline and diesel engines in boats, such as yachts, tugs, and trawlers, following specifications: Positions engine over mounting holes, using chain hoist. Bolts engine to mount and straps fuel tank to cradle, using handtools. Connects fuel, oil, and waterlines to engine. Installs engine controls, propeller shaft, and propeller. Attaches test instruments, such as tachometer and voltmeter to engine. Starts engine and records operating data, such as revolutions per minute, and voltage output. Disassembles defective engines and repairs or replaces damaged parts, using handtools.

Outboard Motor Mechanic (623.281-042)
Analyzes defects, and adjusts or repairs electrical and mechanical systems of outboard motors: Disassembles and inspects motor for defective parts, using mechanic's handtools and gages. Replaces parts, such as gears, magneto points, piston rings, and spark plugs, and reassembles engine. Adjusts carburetor mixture and electrical point settings while motor is running in water-filled test tank. May change propeller to increase motor efficiency, based on size and shape of boat hull. May install or repair steering and throttle controls.

Motorboat Mechanic Helper (623.684-010)
Assists Motorboat Mechanic in repairing gasoline- or diesel-powered motorboats: Removes pumps, generators, and other engine accessories, using handtools. Removes engine head and oil pan to dismantle engine. Removes covers of gear and clutch units or removes entire assemblies as instructed. Washes and cleans disassembled parts. Assists in reassembly of repaired engines.

Boat Rigger (806.464-010)

Installs accessories in outboard or inboard motorboats: Drills holes, attaches brackets, and installs accessories, such as lights, batteries, ignition switches, fuel tanks, and guide pulleys, using handtools and power tools. May change propellers and adjust motors to obtain maximum performance. May install outboard and inboard motors and controls, using handtools. May load boats on trailers and make deliveries to customers.

PROGRAM STANDARDS DESCRIPTION

INTRODUCTION

The Division of Vocational, Adult, and Community Education, Florida State Board of Education, is required by S.B.E. Rule 6A-6.571, to publish VOCATIONAL EDUCATION PROGRAM COURSE STANDARDS annually. The first such standards were published in 1985 and consisted of brief 1-2 page documents called CURRICULUM FRAMEWORKS. These Frameworks contained very brief statements of program objectives and course standards.

Curriculum Frameworks are included in this section of the Program Guide, and contain revised information based on the industry validated competency list. Along with the Curriculum Frameworks are detailed lists of performance objectives called STUDENT PERFORMANCE STANDARDS. The Student Performance Standards are basically performance objective statements for each item on the competency list.

—CAREER MAP COMPETENCY LIST

The Career MAP Competency List was developed by an Industry Advisory Committee and serves as the basis for the Career MAP. This Competency List has been validated by the Industry Representatives and reviewed by Educational Representatives noted in the acknowledgements section of this guide. The list relects the entire range of job tasks performed by employees in industry related jobs. It may include more tasks than is normally taught in a vocational program at any one particular school level and will require that instructors and administrators determine which

specialty areas and tasks are appropriate for their program.

—CURRICULUM FRAMEWORKS

The Curriculum Framework specifies the course title and course number, applicable level, major course concepts, and intended outcomes. The intended outcomes section has been correlated with the competency list to include only those performance areas applicable to the course level and purpose.

—STUDENT PERFORMANCE STANDARDS

The Student Performance Standards are abstracted from the Career MAP Competency List, and corresponds to the Curriculum Framework. Student Performance Standards list the detailed performance objectives that support the intended outcomes identified in the Curriculum Frameworks.

—PROGRAM ARTICULATION

Vocational programs that teach the same subject at high schools, vocational technical schools, and community colleges should be structured to eliminate unnecessary retraining of students who have mastered competencies at a lower school level. This coordination of programs at different school levels is referred to as ARTICULATION. Specifically -ARTICULATION- is an arrangement between secondary and vocational-technical centers, and community colleges, which would allow a student who completed a secondary vocational program to enter an area vocational-technical center or community college and receive credit for the secondary vocational program and be placed in the higher level program at an advanced level. It would also allow a student who completed a vocational program in an area vocational-technical center to

enter a community college program and receive credit for the area vocational-technical center program and be placed in the higher level program at an advanced level.

ARTICULATION in this manner will require vocational teachers to interview each student entering a postsecondary level program and determine what competencies have been previously mastered. The teacher may have to utilize the Career MAP, if available, or some type of pre-test or performance evaluation to verify that the student is in fact still competent in the appropriate tasks. Teachers of postsecondary programs will often have two or more course tracks operating simultaneously, one for those students with no prior experience, and one or more individualized or small group tracks for students with various levels of prior experience.

—CAREER MAP UTILIZATION

I. Career MAP Definition:

A Career Merit Achievement Plan (Career MAP) is a matrix of vocational competencies that is designed for individual students to record the skills they have mastered in school or industry. The MAPs primarily list performance competencies, although some cognitive competencies are included. Career MAPs contain blocks in which each individual task is listed and includes a line for the instructor to sign, indicating that the student has become competent in the performance of the task. Career Maps are published and distributed separately from the Program Guide.

II. Purpose of Career MAPs:

Career MAPs are being developed for each Industrial Education program in the State of Florida as a means to document student activity and performance and to communicate that activity to employers. The MAPs, showing what a student has already mastered, could also be used by the student when transfering to another school system or a higher level program, to integrate the student into those training programs at the student's level of competence. This is particularly important when entering competency based programs using "open entry-open exit" methodology, or when entering an on-the-job industrial training course. Many companies require employees to periodically attend skill upgrade and crosstraining courses and attend short courses for new equipment and process familiarization. The Career MAP can also be used by employees to record their achievement in industry sponsored training activity, so the MAP becomes an individuals lifetime record of technical competency.

III. Recommended Utilization of Career MAPs:

A. Teachers in Florida Industrial Education and other Vocational related programs should provide every student they teach, a Career MAP to record the student's mastery of each competency completed in the course. Teachers should ensure that the use of Career MAPs are explained to students and should ensure that the students take their Career MAPs with them when they leave the course.

B. Students should use Career MAPs as a record of their technical competence as they progress from high school courses and/or

through vocational technical schools, or through community colleges and on into industrial training programs provided by employers. Students pursuing vocational technical careers should use the Career MAP as an overall record of their entire career achievement, maintaining other individual certificates of course completion as supporting documents for Career MAPs.

IV. Career Map Development:

Draft lists of competencies were developed by Industrial Advisory committees under a project administered by the Univerisity of South Florida and funded by the Vocational Division of the State Department of Education. These lists were then reviewed, revised, and validated by craft advisory committees throughout Florida. Committees of teachers as well as industry experts then reviewed the lists. Finally, after Competency Lists were approved by both industry and educational advisors the lists were typeset in a matrix format and printed by the Department of Education. The developers of the MAPs had access to any V-TECS catalogs or Student Performance Standards that were applicable. If objectives were judged relevant they were included but sometimes in different wording. Some competencies listed on the MAP may actually encompass several objectives from other sources or might even be considered as subskills to V-TECS. Career MAPs list competencies that could be learned either in school or after a person has been on the job. Career MAPs, as the words suggest, map the competencies achieved by a person through school training and job experiences.

V. Career MAP's use with Program Guides and Standards:

Course/Program Standards have traditionally been used in the Program Review process and will continue to be used. The Career MAPs do not replace Course/Program Standards. MAPs usually contain competencies beyond those required at the job-entry level. Future editing of Course/Program Standards will more than likely reflect the wording of many of the competencies in the Career MAPs.

Program Guides will be developed for all vocational programs having validated MAPs. The Guide brings together into one document the critical components necessary to initiate or update an existing program. Included in the Program Guide are the MAP competencies, the Program Standards, and guidelines for curriculum development, use of local craft advisory committees, facilities planning, etc.

Career MAPs are intended to facilitate articulation and communication regarding specific vocational programs. The Career MAP is a baseline document for planning and can be used for a variety of purposes: student counseling; curriculum planning; teacher recruitment, and selection; teacher and program updating; facility layout and design; equipment requirement planning; student evaluation; program improvement; and for discussions with craft advisory committees.

Career MAPs can be used to profile the competencies to be mastered for one or more Dictionary of Occupational Titles (DOT) occupations within the major occupational area. Career MAPs reflect state-of-the-art technology for the occupational area and accommodate

competency mastery in an industrial setting through cooperative or internship arrangements. Some advanced competencies included on the MAPs are desirable but not necessary for initial employment and may be learned later as supplemental training. Teachers can acquire class sets of the MAPs and use them daily with students from the first day of instruction, or, after keeping separate records of students' mastery of competencies, teachers can transfer these to the MAP just before students exit from the program. Students can request future employers to authenticate additional competencies as they master them on the job.

VI. Obtaining Additional MAPs:

Contact the Industrial Education Regional Consultant or the DVE Regional Office to order MAPs. Entire class sets are available for teacher use. Teachers or users outside the targeted population may purchase sets for a nominal cost-recovery fee. For additional information or training in the use of the Career MAPs contact the Regional Consultant or:

Dissemination and Diffusion Section
Division of Vocational Adult
& Community Education
Department of Education
Knott Building
Tallahassee, FL 32301
(904) 488-0405 or Suncom 278-0405

LIST OF COMPETENCIES

BASIC MARINE MECHANICS

and

MARINE MECHANICS

November 25, 1985

Listed below are competencies that each Marine Mechanic should possess to be a productive beginning worker in this occupation. The numbers to the right of each competency represent the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialization area.

Number	Specialization
* 1	Marine Mechanic, Deck Engineer (623.281-010)
* 2	Machinist Apprentice, Outside (623.281-022)
* 3	Machinist, Outside (623.281-030)
* 4	Maintenance Mechanic, Engine (623.281-034)
5	Marine Engine Mechanic (623.281-026)

6 Outboard Motor Mechanic (623.281-042)

* 7 Motor Boat Mechanic Helper (623.684-010)

* 8 Boat Rigger (806.464-010)

01.0 SHOP PRACTICES

001	Comply with safety rules & regulations (P)	1 2 3 4 5 6 7 8
002	Use hand tools safely & properly (P)	1 2 3 4 5 6 7 8
003	Set up & use power tools safely & properly (P)	1 2 3 4 5 6 7 8
004	Set up & use precision measuring tools (P)	1 2 3 4 5 6 7 8
005	Drill & remove a broken stud & install helicoil (P)	1 2 3 4 5 6 7 8
006	Identify threaded fasteners by size, type, thread series, thread classes, material hardness, & compatibility (C)	1 2 3 4 5 6 7 8
007	Identify & make gaskets & seals (P)	1 2 3 4 5 6 7 8
008	Read & use parts manuals (P)	1 2 3 4 5 6 7 8
009	Read, interpret, & apply service manuals (P)	1 2 3 4 5 6 7 8
010	Locate & match electrical units by their symbols on a wiring diagram (P)	1 2 3 4 5 6 7 8

02.0 THE BASIC 4-STROKE CYCLE ENGINE

001	Explain the basic principles of the operation of the 4-stroke cycle internal combustion engine (C)	1 4 5 6 7
002	Identify types of 4-stroke cycle engines (C)	1 4 5 6 7
003	Locate engine serial & model numbers (P)	1 4 5 6 7
004	Identify engine assemblies & systems (C)	1 4 5 6 7 8
005	Diagnose valve & head problems by use of the visual inspection method (P)	1 4 5 6 7
006	Diagnose valve & head problems by use of the compression tester method (P)	1 4 5 6 7
007	Diagnose valve & head problems by use of the cylinder air pressure method (P)	1 4 5 6 7
* 008	Diagnose valve & head problems by use of the stethoscope method (P)	1 4 5 6 7
009	Disassemble engine & inspect parts (P)	1 4 5 6 7
010	Clean & inspect head for cracks, warpage, & damaged spark plug threads (P)	1 4 5 6 7
011	Inspect valve for warpage, burns, cracks, stem wear, tip wear, & margin (P)	1 2 3 4 5 6 7
012	Grind valve seats & reface valves (P)	1 2 3 4 5 6 7
013	Check & inspect springs for free height, distortion, & installed height (P)	1 4 5 6 7
014	Adjust valve lash (P)	1 4 5 6 7
015	Move & inspect camshaft & lifters (P)	1 2 3 4 5 6 7
016	Measure camshaft (P)	1 2 3 4 5 6 7

* 017	Service camshaft bearings (P)	1 2 3 4 5 6 7
018	Clean & inspect lifters for wear (P)	1 4 5 6 7
019	Time valve drive assembly (P)	1 4 5 6 7
020	Remove piston from rod assembly (P)	1 2 3 4 5 6 7
021	Measure out-of-round & cylinder taper with dial bore gauge or micrometer (P)	1 2 3 4 5 6 7
022	Check piston pin & boss for wear (P)	1 2 3 4 5 6 7
023	Measure piston ring lands width, out-of-round, & taper (P)	1 2 3 4 5 6 7
024	Measure piston ring gap in cylinder bore (P)	1 2 3 4 5 6 7
025	Install & fit piston pin (P)	1 2 3 4 5 6 7
026	Check rod & piston assembly alignment (P)	1 2 3 4 5 6 7
027	Remove & replace rod bearing (P)	1 2 3 4 5 6 7
028	Bone cylinder & clean (P)	1 2 3 4 5 6 7
029	Install rings on piston (P)	1 2 3 4 5 6 7
030	Measure & check crankshaft with micrometer (P)	1 2 3 4 5 6 7
031	Check for end play (P)	1 2 3 4 5 6 7
032	Check bearing bore with telescoping gauge (P)	1 2 3 4 5 6 7
033	Reassemble engine (P)	1 4 5 6 7
034	Install oil seals (P)	1 4 5 6 7

03.0 THE 4-STROKE CYCLE DIESEL ENGINE (OPTIONAL)

* 001	Explain the basic principles of the operation of the 4-stroke cycle diesel engine (C)	1 4 5 6 7

* 002	Identify types of 4-stroke cycle engines (C)	1 4 5 6 7
* 003	Locate engine serial & model numbers (P)	1 4 5 6 7
* 004	Identify engine assemblies & systems (C)	1 4 5 6 7
* 005	Diagnose valve & head problems by use of the visual inspection method (P)	1 4 5 6 7
* 006	Diagnose valve & head problems by use of the compression tester method (P)	1 4 5 6 7
* 007	Diagnose valve & head problems by use of the cylinder air pressure method (P)	1 4 5 6 7
* 008	Diagnose valve & head problems by use of the stethoscope method (P)	1 4 5 6 7
* 009	Disassemble engine (P)	1 4 5 6 7
* 010	Clean & inspect head for cracks, warpage, & damaged spark plug threads (P)	1 4 5 6 7
* 011	Inspect valve for warpage, burns, cracks, stem wear, tip wear, & margin (P)	1 2 3 4 5 6 7
* 012	Grind valve seats & reface valves (P)	1 2 3 4 5 6 7
* 013	Check & inspect springs for free height, distortion, & installed height (P)	1 4 5 6 7
* 014	Adjust valve lash (P)	1 4 5 6 7
* 015	Remove & inspect camshaft & lifters (P)	1 2 3 4 5 6 7
* 016	Measure camshaft (P)	1 2 3 4 5 6 7
* 017	Service camshaft bearings (P)	1 2 3 4 5 6 7
* 018	Clean & inspect lifters for wear (P)	1 2 3 4 5 6 7
* 019	Time valve drive assembly (P)	1 4 5 6 7
* 020	Remove piston from rod assembly (P)	1 2 3 4 5 6 7

* 021	Measure out-of-round & cylinder taper with dial bore gauge or micrometer (P)	1 2 3 4 5 6 7
* 022	Check piston pin & boss for wear (P)	1 2 3 4 5 6 7
* 023	Measure piston ring lands width, out-of-round & taper (P)	1 2 3 4 5 6 7
* 024	Measure piston ring gap in cylinder bore (P)	1 2 3 4 5 6 7
* 025	Install & fit piston pin (P)	1 2 3 4 5 6 7
* 026	Check rod & piston assembly alignment (P)	1 2 3 4 5 6 7
* 027	Remove & replace rod bearing (P)	1 2 3 4 5 6 7
* 028	Hone cylinder & clean (P)	1 2 3 4 5 6 7
* 029	Install rings on piston (P)	1 2 3 4 5 6 7
* 030	Measure & check crankshaft with micrometer (P)	1 2 3 4 5 6 7
* 031	Check for end play (P)	1 2 3 4 5 6 7
* 032	Check bearing bore with telescoping gauge (P).	1 2 3 4 5 6 7
* 033	Reassemble engine (P)	1 4 5 6 7
* 034	Install oil seals (P)	1 4 5 6 7

04.0 THE BASIC TWO-STROKE CYCLE ENGINE

001	Explain the basic principles of the operation of the 2-stroke cycle internal combustion engine (C)	1 4 5 6 7
002	Identify types of engines (C)	1 4 5 6 7
003	Locate engine serial & model numbers (P)	1 4 5 6 7
004	Identify engine assemblies & systems (C)	1 2 3 4 5 6 7 8
005	Disassemble engine (P)	1 4 5 6 7

006	Remove, clean, & inspect the head for cracks, warpage, & damaged spark plug threads (P)	1 4 5 6 7
007	Diagnose head problems by use of the visual inspection method (P)	1 4 5 6 7
008	Diagnose head problems by use of the compression tester method (P)	1 4 5 6 7
009	Diagnose head problems by use of the cylinder air pressure method (P)	1 4 5 6 7
010	Diagnose head problems by use of the stethoscope method (P)	1 4 5 6 7
011	Remove, clean, & inspect piston rod & assembly (P)	1 4 5 6 7
012	Measure out-of-round piston & cylinder (P)	1 2 3 4 5 6 7
013	Hone cylinders (P)	1 2 3 4 5 6 7
014	Check total bearing surface of connecting rod bearings (P)	1 2 3 4 5 6 7
015	Measure piston skirt & ring grooves (P)	1 2 3 4 5 6 7
016	Measure piston ring gap in cylinder bore (P)	1 2 3 4 5 6 7
017	Install piston pin according to manufacturer's specifications (P)	1 2 3 4 5 6 7
018	Check rod & piston assembly alignment (P)	1 2 3 4 5 6 7
019	Install rings on piston (P)	1 2 3 4 5 6 7
020	Install piston rod assembly (P)	1 2 3 4 5 6 7
021	Measure & check crankshaft with micrometer (P)	1 2 3 4 5 6 7
022	Check needle bearings (P)	1 2 3 4 5 6 7
023	Inspect crankshaft & install seals (P)	1 2 3 4 5 6 7

024	Inspect, clean, &/or replace reed valves (P)	1	4 5 6 7
025	Reassemble engine (P)	1	4 5 6 7

05.0 ELECTRICAL SYSTEMS

001	Set up & use voltmeters, ammeters, & ohmmeters (P)	1	4 5 6 7
002	Locate & identify electrical circuit components (P)	1 2 3	4 5 6 7 8
003	Sketch a typical circuit using single wire system (P)	1	4 5 6 7
004	Test a storage battery using a hydrometer (P)	1	4 5 6 7 8
005	Test a storage battery using light & load test (P)	1	4 5 6 7 8
006	Charge a storage battery (P)	1	4 5 6 7 8
007	Remove & replace battery & service battery box (P)	1	4 5 6 7 8
008	Repair damaged wire & electrical harness (P)	1	4 5 6 7 8
009	Diagnose circuit troubles using continuity or test light & low reading voltmeter to record voltage drop (P)	1	4 5 6 7
010	Sketch & label a typical fuel gauge system (P)	1	4 5 6 7
011	Remove & replace an ampmeter or indicating light (P)	1	4 5 6 7
012	Remove & replace a fuel gauge (P)	1	4 5 6 7
013	Remove & replace a fuel sending unit (P)	1	4 5 6 7
014	Diagnose gauge & accessory system troubles using test light, voltmeter, ampmeter, or detached sending unit (P)	1	4 5 6 7

015	Sketch a typical circuit such as an auto bilge pump or navigation lights (P)	1	4 5 6 7
016	Locate open shorts & grounds (P)	1	4 5 6 7

06.0 CRANKING SYSTEMS

001	Disassemble recoil starters (P)	1	4 5 6 7
002	Inspect components of recoil starters (P)	1	4 5 6 7
003	Reassemble recoil starters (P)	1	4 5 6 7
004	Identify components of an electrical starting system (C)	1	4 5 6 7
005	Disassemble different types of starting motors (P)	1	4 5 6 7
006	Bench test armatures (P)	1	4 5 6
007	Bench test field coils (P)	1	4 5 6
008	Bench test drive units (P)	1	4 5 6
009	Bench test switches (P)	1	4 5 6
010	Bench test minor parts of starting motor components (P)	1	4 5 6
011	Use an armature lathe for turning commutators (P)	1	4 5 6
012	Install new starter parts, reassemble, & test (P)	1	4 5 6
013	Troubleshoot starting system using battery-starter tester (P)	1	4 5 6
014	Troubleshoot starting system using voltmeter for finding excessive voltage drop (P)	1	4 5 6

015	Recondition solenoids, drives, & other components (P)	1	4 5 6
016	Set up & use battery-starter (load) testers (P)	1	4 5 6
017	Locate opens, shorts, & grounds (P)	1	4 5 6

07.0 IGNITION SYSTEMS MAGNETO

100 Ignition Systems Magneto

101	Sketch & label electrical symbols (P)	1	4 5 6 7
102	Set up & use an ohmmeter (P)	1	4 5 6 7
103	Set up & use a voltmeter (P)	1	4 5 6 7
104	Set up & use an ignition tester (P)	1	4 5 6 7
105	Set up & use an ignition analyzer (P)	1	4 5 6 7
106	Locate & identify parts of a magneto ignition (P)	1	4 5 6 7
107	Locate & match electrical units by their symbols on a wiring diagram (P)	1	4 5 6 7
108	Sketch & label a complete magneto ignition system (P)	1	4 5 6 7
109	Check coil resistance with an ohmmeter (P)	1	4 5 6 7
110	Check points for continuity & resistance (P)	1	4 5 6 7
111	Check a condenser for capacity, leaks, & shorts (P)	1	4 5 6 7
112	Clean & regap spark plugs (P)	1	4 5 6 7

200 Battery Ignition Systems

201	Locate & identify parts of a battery ignition (P)	1	4 5 6 7
202	Locate & match electrical units by their symbols on a wiring diagram (P)	1	4 5 6 7
203	Sketch & label a complete battery ignition system (P)	1	4 5 6 7
204	Check coil resistance with an ohmmeter (P)	1	4 5 6 7
205	Check points for continuity & resistance (P)	1	4 5 6 7
206	Check a condenser for capacity, leaks, & shorts (P)	1	4 5 6 7
207	Set up & use test equipment (P)	1	4 5 6 7
208	Set timing using a timing light (P)	1	4 5 6 7

300 Capacitor Discharge Ignition Systems

301	Sketch & label electrical symbols (P)	1	4 5 6 7
302	Set up & use an ohmmeter (P)	1	4 5 6 7
303	Set up & use a CD-77 (P)	1	4 5 6 7
304	Set up & use a spark tester (P)	1	4 5 6 7
305	Set up & use a neon test light (P)	1	4 5 6 7
306	Set up & use a low/high ampmeter (P)	1	4 5 6 7
307	Set up & use a voltmeter (P)	1	4 5 6 7
308	Locate & identify parts of a capacitor discharge ignition system (P)	1	4 5 6 7
309	Locate & match electrical units by their symbols on a wiring diagram (P)	1	4 5 6 7
310	Sketch & label a complete C/D ignition system (P)	1	4 5 6 7

311	Check coil resistance, shorts, & grounds with an ohmmeter (P)	1	4 5 6 7
312	Check stator windings with an ohmmeter (P)	1	4 5 6 7
313	Check sensor coils, charge coils, ignition coils, & shorts to ground with CD-77 (P)	1	4 5 6 7
314	Check a power pack with an ohmmeter & a CD-77 (P)	1	4 5 6 7

08.0 CHARGING SYSTEMS

100 Outboard Systems

101	Sketch & label the units of a complete charging circuit (P)	1	4 5 6
102	Disassemble a charging system & identify the components(P)	1	4 5 6
103	Perform stator & rectifier testing on a charging system (P)	1	4 5 6
104	Reassemble & test a charging system (P)	1	4 5 6
105	Set up & use an ohmmeter (P)	1	4 5 6
106	Test regulators (P)	1	4 5 6
107	Reassemble & test a complete unit (P)	1	4 5 6

200 Inboard/Diesel Systems

* 201	Inspect, remove, & replace alternator belts (P)	1	4 5 6 7 8

* 202	Check charging system output (P)	1	4 5 6 7 8
* 203	Analyze malfunctions (P)	1	4 5 6
* 204	Test & overhaul an alternator (P)	1	4 5 6
* 205	Remove & replace a regulator (P)	1	4 5 6

09.0 FUEL SYSTEMS

100 Fuel Systems Operation

101	Identify & locate fuel system components (fuel tank, lines, filter, etc.) (P)	1	4 5 6 7 8
102	Sketch & label the parts of a total fuel system (P)	1	4 5 6 7 8
103	Service fuel lines (P)	1	4 5 6 7 8
104	Remove, clean, & install a fuel tank (P)	1	4 5 6 7 8
105	Identify & locate the fuel pump vacuum (P)	1	4 5 6 7 8
106	Remove, replace, service, & check the pressure of the fuel pump (P)	1	4 5 6 7 8
107	Remove, clean, & replace an in-line filter (P)	1	4 5 6 7 8
108	Identify the major types of carburetors (C)	1	4 5 6 7 8
109	Check & adjust the throttle & governor linkage (P)	1	4 5 6

200 Two-stroke Cycle Carburetion

201	Sketch & label the parts of a total fuel system (P)	1	4 5 6 7 8
202	Service the fuel lines & primer bulb (vacuum test) (P)	1	4 5 6 7 8

203	Remove, clean, inspect, & install the fuel tank (P)	1	4 5 6 7 8
204	Identify basic carburetor circuits (choke, float, fuel inlet, idle, intermediate, high-speed, main, etc.) (C)	1	4 5 6 7 8
205	Identify & locate the fuel pump (P)	1	4 5 6 7 8
206	Remove, inspect, & replace the fuel pump (P)	1	4 5 6 7 8
207	Remove, clean, overhaul, replace, & make final adjustments to the carburetor (P)	1	4 5 6
208	Remove, service, & replace air cleaners (P)	1	4 5 6 7 8
209	Diagnose carburetor problems (P)	1	4 5 6
210	Remove, inspect, & replace reed valves & gaskets (P)	1	4 5 6
211	Diagnose exhaust problems such as back pressure & scavenging (P)	1	4 5 6
212	Inspect & service oil metering systems (P)	1	4 5 6 7 8
213	Determine & make appropriate fuel-oil mixtures (P)	1	2 3 4 5 6 7 8

300 Inboard Gas Systems

301	Remove, service, & replace carburetor air cleaners/flame arrestors (P)	1	4 5 7 8
302	Identify & locate fuel system components (fuel pumps, carburetor & air, linkage, & intake manifold) (P)	1	4 5 7 8
303	Remove, clean, overhaul, replace, & make final adjustments on the carburetor (P)	1	4 5 7 8

400 Inboard Diesel Systems

* 401	Identify & locate fuel system components (fuel tank, fuel line, fuel pump, air filters, governor & linkage, & fuel injector) (P)	1	4 5	7 8
* 402	Check the fuel system for leaks (P)	1	4 5	7 8
* 403	Bleed the system for starting (P)	1	4 5	7 8
* 404	Adjust nozzle pressure to manufacturer's specifications (P)	1	4 5	7 8
* 405	Set the injection pump angle (timing) (P)	1	4 5	
* 406	Check & adjust the throttle & governor linkage (P)	1	4 5	7 8
* 407	Check or replace glow plugs (P)	1	4 5	7 8
* 408	Check the stop solenoid (P)	1	4 5	7 8

10.0 COOLING

001	Explain the principles of cooling systems, including fresh water cooling systems (C)	1	4 5 6 7	8
002	Trace water flow through a cooling system (P)	1	4 5 6 7	8
* 003	Remove & replace the gear case (P)	1	4 5 6 7	
004	Disassemble the water pump & reassemble (P)	1	4 5 6 7	
005	Remove, check, & replace the thermostat (P)	1	4 5 6 7	
006	Use the thermostat pressure relief system (P)	1	4 5 6 7	

* 007	Service sea strainers through the hull fitting & the valve oil coolers & heat exchangers (P)	1	4 5 6 7 8
* 008	Remove & replace the circulator pump (P)	1	4 5 6 7
* 009	Remove & rebuild a fresh water pump (P)	1	4 5 6 7
* 010	Remove & rebuild an inboard sea pump (P)	1	4 5 6 7
* 011	Remove & rebuild an inboard/outboard sea pump (P)	1	4 5 6 7
012	Service manifolds, risers, & thermostat housings (P)	1	4 5 6 7
013	Service water cooling systems for gas inboard, gas outboard, & diesel engines (P)	1	2 3 4 5 6 7 8

11.0 LUBRICATION SYSTEMS

001	Identify the types & functions of lubrication systems (C)	1	4 5 6 7 8
002	Explain the principles of lubrication systems (C)	1	4 5 6 7 8
003	Identify & locate components of lubrication systems (C)	1	4 5 6 7 8
004	Check the engine for oil leak (P)	1	4 5 6 7 8
005	Change the engine oil & filter (P)	1	4 5 6 7 8
006	Check the engine oil pressure & level (P)	1	4 5 6 7 8
007	Recognize & use only recommended oil (P)	1	4 5 6 7 8

12.0 OUTDRIVES, TRANSMISSION, & INTERMEDIATE HOUSINGS

100 Intermediate Housing

101	Disassemble the main drive shaft (P)	1	4 5 6 7
102	Shim the drive shaft to the intermediate housing (P)	1	4 5 6 7
103	Remove & replace the clutch assembly (P)	1	4 5 6 7
104	Check electrical components with proper test equipment (P)	1	4 5 6 7
105	Remove & replace "U" joints (P)	1	4 5 6 7
106	Disassemble the outer transom plate (P)	1	4 5 6 7
107	Adjust the trim & limit switch (P)	1	4 5 6 7
108	Disassemble the cylinder ram (P)	1	4 5 6 7

200 Stern Drive Upper Gear Case

201	Determine the differences between mechanical, electrical, & hydroelectric shifting units (P)	1	4 5 6 7
202	Disassemble & reassemble each type shifting unit (P)	1	4 5 6 7
203	Reshim to the manufacturer's specifications (P)	1	4 5 6 7
204	Use proper oil to refill upper & lower gear case (P)	1	4 5 6

300 Upper to Lower Gear Case

301	Disassemble the exhaust housing (P)	1	4 5 6
302	Inspect seals, "O" rings, shafts, & bearings (P)	1	4 5 6
303	Reassemble the exhaust housing (P)	1	4 5 6

400 Lower Gear Case

401	Determine the differences between mechanical, electric, & hydraulic shifting (P)	1	4 5 6 7
402	Remove & replace the lower gear case (P)	1	4 5 6 7
403	Reshim the lower gear case (P)	1	4 5 6 7
404	Refill the lower gear case with specified oil (P)	1	4 5 6 7
405	Determine propeller pitch, diameter, & hub type (P)	1	4 5 6 7

500 Transmissions

501	Inspect the planetary clutch plate air coupling assembly (P)	1	4 5 6 7
502	Remove & replace the transmission (P)	1	4 5 6 7
503	Use proper service tools in shimming, reassembly, & testing (P)	1	4 5 6 7

600 Lubrication

601	Drain the transmission (P)	1	4 5 6 7
602	Determine capacity using the transmission service manual (P)	1	4 5 6 7
603	Refill the transmission according to manufacturer's specifications (P)	1	4 5 6 7

13.0 OUTBOARD LOWER UNITS & HOUSING ASSEMBLIES

001	Disassemble & reassemble the steering handle group (P)	1	4 5 6
002	Disassemble & assemble the exhaust housing & water tube assembly (P)	1	4 5 6
003	Replace motor mounts & shock absorbers (P)	1	4 5 6 7
004	Lubricate all fittings (P)	1	4 5 6
005	Pressure & vacuum test the gear case (P)	1	4 5 6
006	Remove & test cylinders & rams (P)	1	4 5 6
007	Adjust reverse locks (P)	1	4 5 6
008	Adjust the trim & tilt (P)	1	4 5 6
009	Determine the differences between mechanical, electrical, & hydroelectric shifting units (P)	1	4 5 6
010	Explain the shifting theory of the lower unit (C)	1	4 5 6
011	Disassemble & reassemble a mechanical shifting unit (P)	1	4 5 6

012	Disassemble & reassemble an electrical shifting unit (P)	1	4 5 6
013	Disassemble & reassemble a hydroelectric shifting unit (P)	1	4 5 6
014	Inspect all parts for wear (P)	1	4 5 6

14.0 WOODS, METALS, & FIBER GLASS

001	Explain the hazards of a marine environment to woods, metals, & fiberglass (C)	1 2 3 4 5 6 7 8
002	Explain a galvanic series (C)	1 2 3 4 5 6 7 8
003	Explain the theory for using materials in boat repair activities (C)	1 2 3 4 5 6 7 8

15.0 TRAILERS

001	Make boat-to-trailer adjustments (P)	1	4 5 6 7 8
002	Remove & replace the lighting systems (P)	1	4 5 6 7
003	Remove & replace the wheel bearings & springs (P)	1	4 5 6 7
004	Remove & replace the brakes (P)	1	4 5 6 7
005	Dissassemble, diagnose, & reassemble the trim & tilt system (P)	1	4 5 6

006	Remove & test the cylinder rams (P)	1	4 5 6
007	Adjust the reverse lock (P)	1	4 5 6
008	Adust trim & tilt (P)	1	4 5 6

16.0 PREPARATION & DELIVERY OF SALES

100 Outboard Installation

101	Make the center line measurement (P)	1	4 5 6
102	Center the plate height (P)	1	4 5 6
103	Locate the manufacturer's I.D. plate (P)	1	4 5 6

200 Control Box Installation

201	Mount the control box at the helm (P)	1	4 5 6 7 8
202	Place the wiring & cables in a neat & & orderly manner (P)	1	4 5 6 7 8

300 Adjustments

301	Adjust the control cables from the engine to the control box (P)	1	4 5 6 7 8
302	Center the steering cable to the engine (P)	1	4 5 6 7 8

400 Accessories Installation

401	Find a suitable location for the accessories & mount them to boat (P)	1	4 5 6 7 8
402	Lubricate the shaft, install the propeller, fasten both securely (P)	1	4 5 6 7 8

500 Check List

501	Check for proper level (P)	1	4 5 6 7 8
502	Check the manufacturer's specifications (P)	1	4 5 6 7 8
503	Test-run the boat (P)	1	4 5 6 7 8
504	Recheck work completed (P)	1	4 5 6 7 8

600 Stern Drive Unit Installation

601	Check the manufacturer's installation procedure (P)	1	4 5 6 7 8
602	Lubricate the shaft & install the propeller securely (P)	1	4 5 6 7 8
603	Obtain maximum oil level capacity (P)	1	4 5 6 7 8

700 Engine Preparation

701	Install or connect the drain plugs, pet cocks, hose clamps, hoses, etc. (P)	1	4 5 6 7 8

702	Find a suitable mount location & mount the engine securely in the boat (P)	1	4 5 6 7 8
703	Set the engine to manufacturer's specifications (P)	1	4 5 6
704	Set or adjust & test the engine to the manufacturer's specifications (P)	1	4 5 6

800 Lighting Systems & Accessories

801	Remove & replace running lights (P)	1	4 5 6 7 8
802	Troubleshoot lighting systems & accessories (P)	1	4 5 6 7 8
803	Check & adjust the throttle, cable, horn, lights, & tachometer (P)	1	4 5 6 7 8

17.0 EMPLOYABILITY SKILLS

001	List sources of job openings other than public or private employment agencies (P)	1 2 3 4 5 6 7 8
002	Write a letter of application for a job (P)	1 2 3 4 5 6 7 8
003	Prepare a resume or personal fact sheet (P)	1 2 3 4 5 6 7 8
004	List factors to consider when applying for a job (P)	1 2 3 4 5 6 7 8
005	List ways of making contact with employers (P)	1 2 3 4 5 6 7 8
006	Identify documents which may be required when applying for a job interview (C)	1 2 3 4 5 6 7 8
007	Complete a job application form correctly (P)	1 2 3 4 5 6 7 8

008	Identify appropriate dress & grooming for a job interview (C)	1 2 3 4 5 6 7 8
009	Classify behaviors considered to be appropriate or inappropriate in a job interview situation (C)	1 2 3 4 5 6 7 8
010	Describe the advantages to the employer & employee of being a productive worker (C)	1 2 3 4 5 6 7 8
011	Explain the purpose of supervision, self-discipline, & performance evaluation (C)	1 2 3 4 5 6 7 8
012	Identify appropriate response(s) to criticism from employer, supervisor, or other employees (C)	1 2 3 4 5 6 7 8
013	List consequences of frequently being absent from the job (P)	1 2 3 4 5 6 7 8
014	List consequences of frequently arriving late for work (P)	1 2 3 4 5 6 7 8
015	List factors to consider when resigning from a job (P)	1 2 3 4 5 6 7 8
016	Write a letter of resignation (P)	1 2 3 4 5 6 7 8
017	Observe the principles of honesty & integrity with employers, customers, & fellow workers (P)	1 2 3 4 5 6 7 8

KEY

(C) Cognitive

(P) Performance

* These specialization areas and competencies are considered appropriate for postsecondary Marine Mechanics programs ONLY.

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Basic Marine Mechanics

CODE NUMBER: Secondary 8751000 Postsecondary _____

Florida CIP 1N49.032600

SECONDARY SCHOOL CREDITS 6 COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVEL(S): ___ 7-9 ___ 9-12 ___ Postsecondary Adult Vocational

___ Postsecondary Vocational X Other (10-12, 21)

CERTIFICATION COVERAGE: DESEL MECH 7 MTRBT MECH @ 7 GASENG RPR 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as marine engine mechanics (623.281-026) and outboard motor mechanics (623.281-042), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices; service and repair of electrical, mechanical, power transfer, hydraulic, fuel and cooling systems; boat rigging and trailers; and preparation of sales merchandise.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in tools, test equipment, current model outboard motors, inboard-outdrive motors, location and installation of accessories, boat trailers, and operational testing.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing communications, leadership, human relations, and employability training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

When the cooperative method of instruction is used, the program length for the secondary program may be increased by a maximum of 2.0 credits.

The typical length of this program for the average achieving student is 900 contact hours (1080 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform shop practices to industry standards
02. Maintain and repair basic 4-stroke cycle engines
03. Maintain and repair basic 2-stroke cycle engines
04. Maintain and repair electrical systems
05. Maintain and repair cranking systems
06. Maintain and repair ignition systems
07. Maintain and repair outboard charging systems
08. Maintain and repair fuel systems
09. Maintain and repair cooling systems
10. Maintain and repair lubrication systems
11. Maintain and repair outdrives, transmissions, and intermediate housings
12. Assemble and maintain outboard lower units and housing assemblies
13. Use marine woods, metals, and fiber glass
14. Adjust and repair trailers
15. Prepare and deliver sales merchandise
16. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

BASIC MARINE MECHANICS

01.0 PERFORM SHOP PRACTICES TO INDUSTRY STANDARDS—The student will be able to:

01.001 Comply with safety rules and regulations

01.002 Use hand tools safely and properly

01.003 Set up and use power tools safely and properly

01.004 Set up and use precision measuring tools

01.005 Drill and remove broken studs and install helicoils

01.006 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility

01.007 Identify and make gaskets and seals

01.008 Read and use parts manuals

01.009 Read, interpret, and apply service manuals

01.010 Locate and match electrical units by their symbols on a wiring diagram

02.0 MAINTAIN AND REPAIR BASIC 4-STROKE CYCLE ENGINES—The student will be able to:

02.001 Explain the basic principles of the operation of 4-stroke cycle internal combustion engines

02.002 Identify types of 4-stroke cycle engines

02.003 Locate engine serial and model numbers

02.004 Identify engine assemblies and systems

02.005 Diagnose valve and head problems by use of the visual inspection method

02.006 Diagnose valve and head problems by use of the compression tester method

02.007 Diagnose valve and head problems by use of the cylinder air pressure method

02.008 Disassemble engines and inspect parts

02.009 Clean and inspect heads for cracks, warpage, and damaged spark plug threads

02.010 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and margin

02.011 Grind valve seats and reface valves

02.012 Check and inspect springs for free height, distortion, and installed height

02.013 Adjust valve lash

02.014 Move and inspect camshafts and lifters

02.015 Measure camshafts

02.016 Clean and inspect lifters for wear

02.017 Time valve drive assemblies

02.018 Remove pistons from rod assemblies

02.019 Measure out-of-round and cylinder taper with a dial bore gauge or micrometer

02.020 Check piston pins and bosses for wear

02.021 Measure piston ring lands width, out-of-round, and taper

02.022 Measure the piston ring gap in cylinder bores

02.023 Install and fit piston pins

02.024 Check rod and piston assembly alignment

02.025 Remove and replace rod bearings

02.026 Hone and clean cylinders

02.027 Install rings on pistons

02.028 Measure and check crankshafts with a micrometer

02.029 Check for end play

02.030 Check bearing bores with a telescoping gauge

02.031 Reassemble engines

02.032 Install oil seals

03.0 MAINTAIN AND REPAIR BASIC 2-STROKE CYCLE ENGINES—The student will be able to:

03.001 Explain the basic principles of the operation of 2-stroke cycle internal combustion engines

03.002 Identify types of engines

03.003 Locate engine serial and model numbers

03.004 Identify engine assemblies and systems

03.005 Disassemble engines

03.006 Remove, clean, and inspect heads for cracks, warpage, and damaged spark plug threads

03.007 Diagnose head problems by use of the visual inspection method

03.008 Diagnose head problems by use of the compression tester method

03.009 Diagnose head problems by use of the cylinder air pressure method

03.010 Diagnose head problems by use of the stethoscope method

03.011 Remove, clean, and inspect piston rods and assemblies

03.012 Measure out-of-round of pistons and cylinders

03.013 Hone cylinders

03.014 Check the total bearing surface of connecting rod bearings

03.015 Measure piston skirts and ring grooves

03.016 Measure the piston ring gap in cylinder bores

03.017 Install piston pins according to manufacturer's specifications

03.018 Check rod and piston assembly alignment

03.019 Install rings on pistons

03.020 Install piston rod assemblies

03.021 Measure and check crankshafts with a micrometer

03.022 Check needle bearings

03.023 Inspect crankshafts and install seals

03.024 Inspect, clean, and/or replace reed valves

03.025 Reassemble engines

04.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS—The student will be able to:

04.001 Set up and use voltmeters, ammeters, and ohmmeters

04.002 Locate and identify electrical circuit components

04.003 Sketch a typical circuit using a single wire system

04.004 Test storage batteries using a hydrometer

04.005 Test storage batteries using a light and load test

04.006 Charge storage batteries

04.007 Remove and replace batteries and service battery boxes

04.008 Repair damaged wire and electrical harnesses

04.009 Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop

04.010 Sketch and label typical fuel gauge systems

04.011 Remove and replace ampmeters or indicating lights

04.012 Remove and replace fuel gauges

04.013 Remove and replace fuel sending units

04.014 Diagnose gauges and accessory system troubles using test lights, voltmeters, ampmeters, or detached sending units

04.015 Sketch typical circuits such as those for auto bilge pumps or navigation lights

04.016 Locate opens, shorts, and grounds

05.0 MAINTAIN AND REPAIR CRANKING SYSTEMS—The student will be able to:

05.001 Disassemble recoil starters

05.002 Inspect components of recoil starters

05.003 Reassemble recoil starters

05.004 Identify components of electrical starting systems

05.005 Disassemble different types of starting motors

05.006 Bench test armatures

05.007 Bench test field coils

05.008 Bench test drive units

05.009 Bench test switches

05.010 Bench test minor parts of starting motor components

05.011 Use armature lathes for turning commutators

05.012 Install, reassemble, and test new starter parts

05.013 Troubleshoot starting systems using battery-starter testers

05.014 Troubleshoot starting systems using voltmeters for finding excessive voltage drop

05.015 Recondition solenoids, drives, and other components

05.016 Set up and use battery-starter (load) testers

05.017 Locate opens, shorts, and grounds

06.0 MAINTAIN AND REPAIR IGNITION SYSTEMS—The student will be able to:

06.1 Maintain and Repair Magneto Ignition Systems

06.101 Sketch and label electrical symbols

06.102 Set up and use ohmmeters

06.103 Set up and use voltmeters

06.104 Set up and use ignition testers

06.105 Set up and use ignition analyzers

06.106 Locate and identify parts of magneto ignitions

06.107 Locate and match electrical units by their symbols on a wiring diagram

06.108 Sketch and label complete magneto ignition systems

06.109 Check coil resistance with an ohmmeter

06.110 Check points for continuity and resistance

06.111 Check condensers for capacity, leaks, and shorts

06.112 Clean and regap spark plugs

06.2 Maintain and Repair Battery Ignition Systems

06.201 Locate and identify parts of battery ignitions

06.202 Locate and match electrical units by their symbols on a wiring diagram

06.203 Sketch and label complete battery ignition systems

06.204 Check coil resistance with an ohmmeter

06.205 Check points for continuity and resistance

06.206 Check condensers for capacity, leaks, and shorts

06.207 Set up and use test equipment

06.208 Set timing using a timing light

06.3 Maintain and Repair Capacitor Discharge Ignition Systems

06.301 Sketch and label electrical symbols

06.302 Set up and use ohmmeters

06.303 Set up and use a CD-77

06.304 Set up and use spark testers

06.305 Set up and use neon test lights

06.306 Set up and use low/high ampmeters

06.307 Set up and use voltmeters

06.308 Locate and identify parts of capacitor discharge ignition systems

06.309 Locate and match electrical units by their symbols on a wiring diagram

06.310 Sketch and label complete C/D ignition systems

06.311 Check coil resistance, shorts, and grounds with an ohmmeter

06.312 Check stator windings with an ohmmeter

06.313 Check sensor coils, charge coils, ignition coils, and shorts to ground with a CD-77

06.314 Check power packs with an ohmmeter and a CD-77

07.0 MAINTAIN AND REPAIR OUTBOARD CHARGING SYSTEMS--The student will be able to:

07.001 Sketch and label the units of complete charging circuits

07.002 Disassemble charging systems and identify the components

07.003 Perform stator and rectifier testing on charging systems

07.004 Reassemble and test charging systems

07.005 Set up and use ohmmeters

07.006 Test regulators

07.007 Reassemble and test complete units

08.0 MAINTAIN AND REPAIR FUEL SYSTEMS—The student will be able to:

08.1 Maintain and Repair Fuel Systems

08.101 Identify and locate fuel system components (fuel tanks, lines, filters, etc.)

08.102 Sketch and label the parts of total fuel systems

08.103 Service fuel lines

08.104 Remove, clean, and install fuel tanks

08.105 Identify and locate fuel pump vacuums

08.106 Remove, replace, service, and check the pressure of fuel pumps

08.107 Remove, clean, and replace in-line filters

08.108 Identify the major types of carburetors

08.109 Check and adjust throttle and governor linkages

08.2 Maintain and Repair Two-stroke Cycle Carburetors

08.201 Sketch and label the parts of total fuel systems

08.202 Service fuel lines and primer bulbs (vacuum test)

08.203 Remove, clean, inspect, and install fuel tanks

08.204 Identify basic carburetor circuits (chokes; floats; fuel inlets; idle, intermediate, and high speeds; mains, etc.)

08.205 Identify and locate fuel pumps

08.206 Remove, inspect, and replace fuel pumps

08.207 Remove, clean, overhaul, replace, and make final adjustments to carburetors

08.208 Remove, service, and replace air cleaners

08.209 Diagnose carburetor problems

08.210 Remove, inspect, and replace reed valves and gaskets

08.211 Diagnose exhaust problems such as back pressure and scavenging

08.212 Inspect and service oil metering systems

08.213 Determine and make appropriate fuel-oil mixtures

08.3 Maintain and Repair Inboard Gas Systems

08.301 Remove, service, and replace carburetor air cleaners/flame arrestors

08.302 Identify and locate fuel system components (fuel pumps, carburetors and air filters, linkages, and intake manifolds)

08.303 Remove, clean, overhaul, replace, and make final adjustments to carburetors

09.0 MAINTAIN AND REPAIR COOLING SYSTEMS—The student will be able to:

09.001 Explain the principles of cooling systems, including fresh water cooling systems

09.002 Trace water flow through cooling systems

09.003 Disassemble and reassemble water pumps

09.004 Remove, check, and replace thermostats

09.005 Use thermostat pressure relief systems

09.006 Service manifolds, risers, and thermostat housings

09.007 Service water cooling systems for gas inboard, gas outboard, and diesel engines

10.0 MAINTAIN AND REPAIR LUBRICATION SYSTEMS—The student will be able to:

10.001 Identify the types and functions of lubrication systems

10.002 Explain the principles of lubrication systems

10.003 Identify and locate components of lubrication systems

10.004 Check engines for oil leaks

10.005 Change engine oil and filters

10.006 Check engine oil pressure and level

10.007 Recognize and use only recommended oil

11.0 MAINTAIN AND REPAIR OUTDRIVES, TRANSMISSIONS, AND INTERMEDIATE HOUSINGS—The student will be able to:

11.1 Maintain and Repair Intermediate Housings

11.101 Disassemble main drive shafts

11.102 Shim drive shafts to intermediate housings

11.103 Remove and replace clutch assemblies

11.104 Check electrical components with proper test equipment

11.105 Remove and replace "U" joints

11.106 Disassemble outer transom plates

11.107 Adjust trim and limit switches

11.108 Disassemble cylinder rams

11.2 Maintain and Repair Stern Drive Upper Gear Cases

11.201 Determine the differences between mechanical, electrical, and hydraulic shifting units

11.202 Disassemble and reassemble each type of shifting unit

11.203 Reshim units to manufacturer's specifications

11.204 Use the proper oil to refill upper and lower gear cases

11.3 Perform Upper to Lower Gear Case Maintenance

11.301 Disassemble exhaust housings

11.302 Inspect seals, "O" rings, shafts, and bearings

11.303 Reassemble exhaust housings

11.4 Maintain and Repair Lower Gear Cases

11.401 Determine the differences between mechanical, electrical, and hydraulic shifting

11.402 Remove and replace lower gear cases

11.403 Reshim lower gear cases

11.404 Refill lower gear cases with specified oil

11.405 Determine propeller pitch, diameter, and hub type

11.5 Maintain and Repair Transmissions

11.501 Inspect planetary clutch plate air coupling assemblies

11.502 Remove and replace transmissions

11.503 Use proper service tools in shimming, reassembly, and testing

11.6 Lubricate Transmissions

11.601 Drain transmissions

11.602 Determine capacity using the transmission service manuals

11.603 Refill transmissions according to manufacturer's specifications

12.0 ASSEMBLE AND MAINTAIN OUTBOARD LOWER UNITS AND HOUSING ASSEMBLIES —The student will be able to:

12.001 Disassemble and reassemble steering handle groups

12.002 Disassemble and assemble exhaust housings and water tube assemblies

12.003 Replace motor mounts and shock absorbers

12.004 Lubricate all fittings

12.005 Pressure and vacuum test gear cases

12.006 Remove and test cylinders and rams

12.007 Adjust reverse locks

12.008 Adjust the trim and tilt

12.009 Determine the differences between mechanical, electrical, and hydraulic shifting units

12.010 Explain the shifting theory of the lower unit

12.011 Disassemble and reassemble mechanical shifting units

12.012 Disassemble and reassemble electrical shifting units

12.013 Disassemble and reassemble hydraulic shifting units

12.014 Inspect all parts for wear

13.0 USE MARINE WOODS, METALS, AND FIBER GLASS—The student will be able to:

13.001 Explain the hazards of a marine environment to woods, metals, and fiber glass

13.002 Explain a galvanic series

13.003 Explain the theory for using given materials in boat repair activities

14.0 ADJUST AND REPAIR TRAILERS—The student will be able to:

14.001 Make boat-to-trailer adjustments

14.002 Remove and replace lighting systems

14.003 Remove and replace wheel bearings and springs

14.004 Remove and replace brakes

14.005 Dissassemble, diagnose, and reassemble trim and tilt systems

14.006 Remove and test cylinder rams

14.007 Adjust reverse locks

14.008 Adust the trim and tilt

15.0 PREPARE AND DELIVER SALES MERCHANDISE—The student will be able to:

15.1 Install Outboard Motors

15.101 Make center line measurements

15.102 Center the plate height

15.103 Locate manufacturers' I.D. plates

15.2 Install Control Boxes

15.201 Mount control boxes at the helm

15.202 Place wiring and cables in a neat and orderly manner

15.3 Make Appropriate Adjustments

15.301 Adjust the control cables from the engine to the control box

15.302 Center the steering cable to the engine

15.4 Install Accessories

15.401 Find suitable locations for accessories and mount them to the boat

15.402 Lubricate shafts, install propellers, and fasten both securely

15.5 Follow and Complete a Servicing Check List

15.501 Check for proper levels

15.502 Check manufacturers' specifications

15.503 Test-run boats

15.504 Recheck work completed

15.6 Install Stern Drive Units

15.601 Check manufacturers' installation procedures

15.602 Lubricate shafts and install propellers securely

15.603 Obtain maximum oil level capacity

15.7 Prepare Engines

15.701 Install or connect drain plugs, pet cocks, hose clamps, hoses, etc.

15.702 Find a suitable mount location and mount the engine securely in the boat

15.703 Set engines to manufacturer's specifications

15.704 Set, adjust, and test engines to manufacturer's specifications

15.8 Install Lighting Systems and Accessories

15.801 Remove and replace running lights

15.802 Troubleshoot lighting systems and accessories

15.803 Check and adjust throttles, cables, horns, lights, and tachometers

16.0 DEMONSTRATE EMPLOYABILITY SKILLS—The student will be able to:

16.001 List sources of job openings other than public or private employment agencies

16.002 Write a letter of application for a job

16.003 Prepare a resume or personal fact sheet

16.004 List factors to consider when applying for a job

16.005 List ways of making contact with employers

16.006 Identify documents which may be required when applying for a job interview

16.007 Complete a job application form correctly

16.008 Identify appropriate dress and grooming for a job interview

16.009 Classify behaviors considered to be appropriate or inappropriate in a job interview situation

16.010 Describe advantages to the employer and employee of being a productive worker

16.011 Explain the purpose of supervision, self-discipline, and performance evaluation

16.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

16.013 List consequences of frequently being absent from the job

16.014 List consequences of frequently arriving late for work

16.015 List factors to consider when resigning from a job

16.016 Write a letter of resignation

16.017 Observe the principles of honesty and integrity with employers, customers, and fellow workers

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Marine Mechanics

CODE NUMBER: Secondary _____ Postsecondary MTE0991

Florida CIP IN49.030600

SECONDARY SCHOOL CREDITS _____ COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVEL(S): ___ 7-9 ___ 9-12 ___ Postsecondary Adult Vocational

___ Postsecondary Vocational X Other (13-17)

CERTIFICATION COVERAGE: DESEL MECH 7 MRIBT MECH @ 7 GASENG RPR 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as marine mechanics/deck engineers (623.281-010), outside machinist apprentices (623.281-022), outside machinists (623.281-030), engine maintenance mechanics (623.281-034), marine engine mechanics (623.281-026), outboard motor mechanics (623.281-042), motor boat mechanic helpers (623.684-010), and boat riggers (806.464-010), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, service, repair, and overhaul of

4-stroke and 2-stroke cycle engines and outboard motors, to include electrical systems, fuel systems, power transfer systems, ignition systems, cooling systems, lubrication systems, drive systems, boat and trailer rigging, and service and repair of boating accessories.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in tools, test equipment, welding procedures, current model outboard motors, inboard-outboard motors, and operational testing.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing communications, leadership, human relations, and employability training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

In accordance with Section 240.149 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform shop practices to industry standards
02. Maintain and repair basic 4-stroke cycle engines
03. Maintain and repair 4-stroke cycle diesel engines (optional)
04. Maintain and repair basic 2-stroke cycle engines
05. Maintain and repair electrical systems
06. Maintain and repair cranking systems
07. Maintain and repair ignition systems
08. Maintain and repair charging systems
09. Maintain and repair fuel systems
10. Maintain and repair cooling systems
11. Maintain and repair lubrication systems
12. Maintain and repair outdrives, transmissions, and intermediate housings

13. Assemble and maintain outboard lower units and housing assemblies
14. Use marine woods, metals, and fiber glass
15. Adjust and repair trailers
16. Prepare and deliver sales merchandise
17. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

MARINE MECHANICS

01.0 PERFORM SHOP PRACTICES TO INDUSTRY STANDARDS--The student will be able to:

01.001 Comply with safety rules and regulations

01.002 Use hand tools safely and properly

01.003 Set up and use power tools safely and properly

01.004 Set up and use precision measuring tools

01.005 Drill and remove broken studs and install helicoils

01.006 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility

01.007 Identify and make gaskets and seals

01.008 Read and use parts manuals

01.009 Read, interpret, and apply service manuals

01.010 Locate and match electrical units by their symbols on a wiring diagram

02.0 MAINTAIN AND REPAIR BASIC 4-STROKE CYCLE ENGINES—The student will be able to:

02.001 Explain the basic principles of the operation of 4-stroke cycle internal combustion engines

02.002 Identify types of 4-stroke cycle engines

02.003 Locate engine serial and model numbers

02.004 Identify engine assemblies and systems

02.005 Diagnose valve and head problems by use of the visual inspection method

02.006 Diagnose valve and head problems by use of the compression tester method

02.007 Diagnose valve and head problems by use of the cylinder air pressure method

02.008 Diagnose valve and head problems by use of the stethoscope method

02.009 Disassemble engines and inspect parts

02.010 Clean and inspect heads for cracks, warpage, and damaged spark plug threads

02.011 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and margin

02.012 Grind valve seats and reface valves

02.013 Check and inspect springs for free height, distortion, and installed height

02.014 Adjust valve lash

02.015 Move and inspect camshafts and lifters

02.016 Measure camshafts

02.017 Service camshaft bearings

02.018 Clean and inspect lifters for wear

02.019 Time valve drive assemblies

02.020 Remove pistons from rod assemblies

02.021 Measure out-of-round and cylinder taper with a dial bore gauge or micrometer

02.022 Check piston pins and bosses for wear

02.023 Measure piston ring lands width, out-of-round, and taper

02.024 Measure the piston ring gap in cylinder bores

02.025 Install and fit piston pins

02.026 Check rod and piston assembly alignment

02.027 Remove and replace rod bearings

02.028 Hone and clean cylinders

02.029 Install rings on pistons

02.030 Measure and check crankshafts with a micrometer

02.031 Check for end play

02.032 Check bearing bores with a telescoping gauge

02.033 Reassemble engines

02.034 Install oil seals

03.0 MAINTAIN AND REPAIR 4-STROKE CYCLE DIESEL ENGINES (OPTIONAL)

—The student will be able to:

03.001 Explain the basic principles of the operation of 4-stroke cycle diesel engines

03.002 Identify types of 4-stroke cycle engines

03.003 Locate engine serial and model numbers

03.004 Identify engine assemblies and systems

03.005 Diagnose valve and head problems by use of the visual inspection method

03.006 Diagnose valve and head problems by use of the compression tester method

03.007 Diagnose valve and head problems by use of the cylinder air pressure method

03.008 Diagnose valve and head problems by use of the stethoscope method

03.009 Disassemble engines

03.010 Clean and inspect heads for cracks, warpage, and damaged spark plug threads

03.011 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and margin

03.012 Grind valve seats and reface valves

03.013 Check and inspect springs for free height, distortion, and installed height

03.014 Adjust valve lash

03.015 Remove and inspect camshafts and lifters

03.016 Measure camshafts

03.017 Service camshaft bearings

03.018 Clean and inspect lifters for wear

03.019 Time valve drive assemblies

03.020 Remove pistons from rod assemblies

03.021 Measure out-of-round and cylinder taper with a dial bore gauge or micrometer

03.022 Check piston pins and bosses for wear

03.023 Measure piston ring lands width, out-of-round and taper

03.024 Measure the piston ring gap in cylinder bores

03.025 Install and fit piston pins

03.026 Check rod and piston assembly alignment

03.027 Remove and replace rod bearings

03.028 Hone and clean cylinders

03.029 Install rings on pistons

03.030 Measure and check crankshafts with a micrometer

03.031 Check for end play

03.032 Check bearing bores with a telescoping gauge

03.033 Reassemble engines

03.034 Install oil seals

04.0 MAINTAIN AND REPAIR BASIC 2-STROKE CYCLE ENGINES--The student will be able to:

04.001 Explain the basic principles of the operation of 2-stroke cycle internal combustion engines

04.002 Identify types of engines

04.003 Locate engine serial and model numbers

04.004 Identify engine assemblies and systems

04.005 Disassemble engines

04.006 Remove, clean, and inspect heads for cracks, warpage, and damaged spark plug threads

04.007 Diagnose head problems by use of the visual inspection method

04.008 Diagnose head problems by use of the compression tester method

04.009 Diagnose head problems by use of the cylinder air pressure method

04.010 Diagnose head problems by use of the stethoscope method

04.011 Remove, clean, and inspect piston rods and assemblies

04.012 Measure out-of-round of pistons and cylinders

04.013 Hone cylinders

04.014 Check the total bearing surface of connecting rod bearings

04.015 Measure piston skirts and ring grooves

04.016 Measure the piston ring gap in cylinder bores

04.017 Install piston pins according to manufacturer's specifications

04.018 Check rod and piston assembly alignment

04.019 Install rings on pistons

04.020 Install piston rod assemblies

04.021 Measure and check crankshafts with a micrometer

04.022 Check needle bearings

04.023 Inspect crankshafts and install seals

04.024 Inspect, clean, and/or replace reed valves

04.025 Reassemble engines

05.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS--The student will be able to:

05.001 Set up and use voltmeters, ammeters, and ohmmeters

05.002 Locate and identify electrical circuit components

05.003 Sketch a typical circuit using a single wire system

05.004 Test storage batteries using a hydrometer

05.005 Test storage batteries using a light and load test

05.006 Charge storage batteries

05.007 Remove and replace batteries and service battery boxes

05.008 Repair damaged wire and electrical harnesses

05.009 Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop

05.010 Sketch and label typical fuel gauge systems

05.011 Remove and replace ampmeters or indicating lights

05.012 Remove and replace fuel gauges

05.013 Remove and replace fuel sending units

05.014 Diagnose gauges and accessory system troubles using test lights, voltmeters, ampmeters, or detached sending units

05.015 Sketch typical circuits such as those for auto bilge pumps or navigation lights

05.016 Locate opens, shorts, and grounds

06.0 MAINTAIN AND REPAIR CRANKING SYSTEMS—The student will be able to:

06.001 Disassemble recoil starters

06.002 Inspect components of recoil starters

06.003 Reassemble recoil starters

06.004 Identify components of electrical starting systems

06.005 Disassemble different types of starting motors

06.006 Bench test armatures

06.006 Bench test field coils

06.008 Bench test drive units

06.009 Bench test switches

06.010 Bench test minor parts of starting motor components

06.011 Use armature lathes for turning commutators

06.012 Install, reassemble, and test new starter parts

06.013 Troubleshoot starting systems using battery-starter testers

06.014 Troubleshoot starting systems using voltmeters for finding excessive voltage drop

06.015 Recondition solenoids, drives, and other components

06.016 Set up and use battery-starter (load) testers

06.017 Locate opens, shorts, and grounds

07.0 MAINTAIN AND REPAIR IGNITION SYSTEMS--The student will be able to:

07.1 Maintain and Repair Magneto Ignition Systems

07.101 Sketch and label electrical symbols

07.102 Set up and use ohmmeters

07.103 Set up and use voltmeters

07.104 Set up and use ignition testers

07.105 Set up and use ignition analyzers

07.106 Locate and identify parts of magneto ignitions

07.107 Locate and match electrical units by their symbols on a wiring diagram

07.108 Sketch and label complete magneto ignition systems

07.109 Check coil resistance with an ohmmeter

07.110 Check points for continuity and resistance

07.111 Check condensers for capacity, leaks, and shorts

07.112 Clean and regap spark plugs

07.2 Maintain and Repair Battery Ignition Systems

07.201 Locate and identify parts of battery ignitions

07.202 Locate and match electrical units by their symbols on a wiring diagram

07.203 Sketch and label complete battery ignition systems

07.204 Check coil resistance with an ohmmeter

07.205 Check points for continuity and resistance

07.206 Check condensers for capacity, leaks, and shorts

07.207 Set up and use test equipment

07.208 Set timing using a timing light

07.3 Maintain and Repair Capacitor Discharge Ignition Systems

07.301 Sketch and label electrical symbols

07.302 Set up and use ohmmeters

07.303 Set up and use a CD-77

07.304 Set up and use spark testers

07.305 Set up and use neon test lights

07.306 Set up and use low/high ampmeters

07.307 Set up and use voltmeters

07.308 Locate and identify parts of capacitor discharge ignition systems

07.309 Locate and match electrical units by their symbols on a wiring diagram

07.310 Sketch and label complete C/D ignition systems

07.311 Check coil resistance, shorts, and grounds with an ohmmeter

07.312 Check stator windings with an ohmmeter

07.313 Check sensor coils, charge coils, ignition coils, and shorts to ground with a CD-77

07.314 Check power packs with an ohmmeter and a CD-77

08.0 MAINTAIN AND REPAIR CHARGING SYSTEMS--The student will be able to:

08.1 Maintain and Repair Outboard Systems

08.101 Sketch and label the units of complete charging circuits

08.102 Disassemble charging systems and identify the components

08.103 Perform stator and rectifier testing on charging systems

08.104 Reassemble and test charging systems

08.105 Set up and use ohmmeters

08.106 Test regulators

08.107 Reassemble and test complete units

08.2 Maintain and Repair Inboard/Diesel Systems

08.201 Inspect, remove, and replace alternator belts

08.202 Check the output of charging systems

08.203 Analyze malfunctions

08.204 Test and overhaul alternators

08.205 Remove and replace regulators

09.0 MAINTAIN AND REPAIR FUEL SYSTEMS—The student will be able to:

09.1 Maintain and Repair Fuel Systems

09.101 Identify and locate fuel system components (fuel tanks, lines, filters, etc.)

09.102 Sketch and label the parts of total fuel systems

09.103 Service fuel lines

09.104 Remove, clean, and install fuel tanks

09.105 Identify and locate fuel pump vacuums

09.106 Remove, replace, service, and check the pressure of fuel pumps

09.107 Remove, clean, and replace in-line filters

09.108 Identify the major types of carburetors

09.109 Check and adjust throttle and governor linkages

09.2 Maintain and Repair Two-stroke Cycle Carburetors

09.201 Sketch and label the parts of total fuel systems

09.202 Service fuel lines and primer bulbs (vacuum test)

09.203 Remove, clean, inspect, and install fuel tanks

09.204 Identify basic carburetor circuits (chokes; floats; fuel inlets; idle, intermediate, and high speeds; mains, etc.)

09.205 Identify and locate fuel pumps

09.206 Remove, inspect, and replace fuel pumps

09.207 Remove, clean, overhaul, replace, and make final adjustments to carburetors

09.208 Remove, service, and replace air cleaners

09.209 Diagnose carburetor problems

09.210 Remove, inspect, and replace reed valves and gaskets

09.211 Diagnose exhaust problems such as back pressure and scavenging

09.212 Inspect and service oil metering systems

09.213 Determine and make appropriate fuel-oil mixtures

09.3 Maintain and Repair Inboard Gas Systems

09.301 Remove, service, and replace carburetor air cleaners/flame arrestors

09.302 Identify and locate fuel system components (fuel pumps, carburetors and air filters, linkages, and intake manifolds)

09.303 Remove, clean, overhaul, replace, and make final adjustments to carburetors

09.4 Maintain and Repair Inboard Diesel Systems

09.401 Identify and locate fuel system components (fuel tanks, fuel lines, fuel pumps, air filters, governors and linkages, and fuel injectors)

09.402 Check fuel systems for leaks

09.403 Bleed systems for starting

09.404 Adjust nozzle pressure to manufacturer's specifications

09.405 Set the injection pump angle (timing)

09.406 Check and adjust the throttle and governor linkage

09.407 Check or replace glow plugs

09.408 Check stop solenoids

10.0 MAINTAIN AND REPAIR COOLING SYSTEMS—The student will be able to:

10.001 Explain the principles of cooling systems, including fresh water cooling systems

10.002 Trace water flow through cooling systems

10.003 Remove and replace gear cases

10.004 Disassemble and reassemble water pumps

10.005 Remove, check, and replace thermostats

10.006 Use thermostat pressure relief systems

10.007 Service sea strainers through hull fittings and valve oil coolers and heat exchangers

10.008 Remove and replace circulator pumps

10.009 Remove and rebuild fresh water pumps

10.010 Remove and rebuild inboard sea pumps

10.011 Remove and rebuild inboard/outboard sea pumps

10.012 Service manifolds, risers, and thermostat housings

10.013 Service water cooling systems for gas inboard, gas outboard, and diesel engines

11.0 MAINTAIN AND REPAIR LUBRICATION SYSTEMS--The student will be able to:

11.001 Identify the types and functions of lubrication systems

11.002 Explain the principles of lubrication systems

11.003 Identify and locate components of lubrication systems

11.004 Check engines for oil leaks

11.005 Change engine oil and filters

11.006 Check engine oil pressure and level

11.007 Recognize and use only recommended oil

12.0 MAINTAIN AND REPAIR OUTDRIVES, TRANSMISSION, AND INTERMEDIATE HOUSINGS --The student will be able to:

12.1 Maintain and Repair Intermediate Housings

12.101 Disassemble main drive shafts

12.102 Shim drive shafts to intermediate housings

12.103 Remove and replace clutch assemblies

12.104 Check electrical components with proper test equipment

12.105 Remove and replace "U" joints

12.106 Disassemble outer transom plates

12.107 Adjust trim and limit switches

12.108 Disassemble cylinder rams

12.2 Maintain and Repair Stern Drive Upper Gear Cases

12.201 Determine the differences between mechanical, electrical, and hydraulic shifting units

12.202 Disassemble and reassemble each type of shifting unit

12.203 Reshim units to manufacturer's specifications

12.204 Use the proper oil to refill upper and lower gear cases

12.3 Perform Upper to Lower Gear Case Maintenance

12.301 Disassemble exhaust housings

12.302 Inspect seals, "O" rings, shafts, and bearings

12.303 Reassemble exhaust housings

12.4 Maintain and Repair Lower Gear Cases

12.401 Determine the differences between mechanical, electrical, and hydraulic shifting

12.402 Remove and replace lower gear cases

12.403 Reshim lower gear cases

12.404 Refill lower gear cases with specified oil

12.405 Determine propeller pitch, diameter, and hub type

12.5 Maintain and Repair Transmissions

12.501 Inspect planetary clutch plate air coupling assemblies

12.502 Remove and replace transmissions

12.503 Use proper service tools in shimming, reassembly, and testing

12.6 Lubricate Transmissions

12.601 Drain transmissions

12.602 Determine capacity using the transmission service manuals

12.603 Refill transmissions according to manufacturer's specifications

13.0 ASSEMBLE AND MAINTAIN OUTBOARD LOWER UNITS AND HOUSING ASSEMBLIES —The student will be able to:

13.001 Disassemble and reassemble steering handle groups

13.002 Disassemble and assemble exhaust housings and water tube assemblies

13.003 Replace motor mounts and shock absorbers

13.004 Lubricate all fittings

13.005 Pressure and vacuum test gear cases

13.006 Remove and test cylinders and rams

13.007 Adjust reverse locks

13.008 Adjust the trim and tilt

13.009 Determine the differences between mechanical, electrical, and hydraulic shifting units

13.010 Explain the shifting theory of the lower unit

13.011 Disassemble and reassemble mechanical shifting units

13.012 Disassemble and reassemble electrical shifting units

13.013 Disassemble and reassemble hydraulic shifting units

13.014 Inspect all parts for wear

14.0 USE MARINE WOODS, METALS, AND FIBER GLASS--The student will be able to:

14.001 Explain the hazards of a marine environment to woods, metals, and fiber glass

14.002 Explain a galvanic series

14.003 Explain the theory for using given materials in boat repair activities

15.0 ADJUST AND REPAIR TRAILERS--The student will be able to:

15.001 Make boat-to-trailer adjustments

15.002 Remove and replace lighting systems

15.003 Remove and replace wheel bearings and springs

15.004 Remove and replace brakes

15.005 Dissassemble, diagnose, and reassemble trim and tilt systems

15.006 Remove and test cylinder rams

15.007 Adjust reverse locks

15.008 Adust the trim and tilt

16.0 PREPARE AND DELIVER SALES MERCHANDISE—The student will be able to:

16.1 Install Outboard Motors

16.101 Make center line measurements

16.102 Center the plate height

16.103 Locate manufacturers' I.D. plates

16.2 Install Control Boxes

16.201 Mount control boxes at the helm

16.202 Place wiring and cables in a neat and orderly manner

16.3 Make Appropriate Adjustments

16.301 Adjust the control cables from the engine to the control box

16.302 Center the steering cable to the engine

16.4 Install Accessories

16.401 Find suitable locations for accessories and mount them to the boat

16.402 Lubricate shafts, install propellers, and fasten both securely

16.5 Follow and Complete a Servicing Check List

16.501 Check for proper levels

16.502 Check manufacturers' specifications

16.503 Test-run boats

16.504 Recheck work completed

16.6 Install Stern Drive Units

16.601 Check manufacturers' installation procedures

16.602 Lubricate shafts and install propellers securely

16.603 Obtain maximum oil level capacity

16.7 Prepare Engines

16.701 Install or connect drain plugs, pet cocks, hose clamps, hoses, etc.

16.702 Find a suitable mount location and mount the engine securely in the boat

16.703 Set engines to manufacturer's specifications

16.704 Set, adjust, and test engines to manufacturer's specifications

16.8 Install Lighting Systems and Accessories

16.801 Remove and replace running lights

16.802 Troubleshoot lighting systems and accessories

16.803 Check and adjust throttles, cables, horns, lights, and tachometers

17.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

17.001 List sources of job openings other than public or private employment agencies

17.002 Write a letter of application for a job

17.003 Prepare a resume or personal fact sheet

17.004 List factors to consider when applying for a job

17.005 List ways of making contact with employers

17.006 Identify documents which may be required when applying for a job interview

17.007 Complete a job application form correctly

17.008 Identify appropriate dress and grooming for a job interview

17.009 Classify behaviors considered to be appropriate or inappropriate in a job interview situation

17.010 Describe advantages to the employer and employee of being a productive worker

17.011 Explain the purpose of supervision, self-discipline, and performance evaluation

17.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

17.013 List consequences of frequently being absent from the job

17.014 List consequences of frequently arriving late for work

17.015 List factors to consider when resigning from a job

17.016 Write a letter of resignation

17.017 Observe the principles of honesty and integrity with employers, customers, and fellow workers

INSTRUCTIONAL APPROACH

Local decisions must be made by school administrators & teachers concerning the appropriate methods to use to deliver instruction & measure student achievement. In many instances, a mix of various instructional approaches may be deemed appropriate to present instruction in a comprehensive and efficient manner. It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. The teacher must lead the students through the learning experiences in a course. This leadership role requires the teacher to motivate students to aggressively pursue learning activities. The teacher must select the methods of instruction that best apply to the students ability levels and that allow the teacher to control the learning processes, to measure student achievement, and to provide feedback to the student.

KEY FACTORS TO CONSIDER

—Student Characteristics

Adolescent - Immature students need constant control, a high degree of motivational leadership, and relatively simple learning activities.

Adult - Mature students are more often self-motivated, need less control, and can accept complex learning activities.

Prerequisites - Can the student read, write, calculate mathmatics, and understand English language at the ability level required to complete learning activities.

—Teacher Characteristics

Subject Knowledge - The teacher must be a subject matter expert—must be able to teach instructional concepts and evaluate student performance. Should have significant amount of experience actually working in industry/vocational area.

Instructional Delivery - The teacher must motivate and lead the student as well as know how to organize and present various types of instruction. Innovative instructional methods should not be attempted if the instructor is not qualified to use them.

Instructional Development - Teachers must select materials, and often develop their own materials, to be used by students. The materials used must support the methods of delivery. The teacher must be qualified to select and develop course materials, or else use instructional packages developed by other qualified sources.

Instructional Measurement - Teachers must select testing methods that support the instructional delivery system used. Teachers must be qualified to develop, administer, and evaluate both written and performance type tests.

—Instructional Setting Characteristics

Time Constraints - Traditional methods of instruction in school systems are controlled by the time periods available. Instruction must be made to fit the time available for training unless the time constraints are removed. If time constraints are not a factor, innovative methods of instruction may be appropriate such as:

- open-entry/open-exit
- self-paced/independent study
- computer based instruction

- competency based instruction

Facilities and Equipment - Instructional methods selected must take into consideration the space available, the number of work stations for students and the amount of tools and equipment available for student use.

CONVENTIONAL INSTRUCTIONAL METHODS:

Any given course of instruction may require some instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve skill competency. If mastery of a task is required, competency-based education methods may be more appropriate. If the training activity envolves an orientation or a seldom performed nonessential task, conventional instructional methods are acceptable.

COMPETENCY-BASED VOCATIONAL EDUCATION INSTRUCTIONAL METHODS:

The focus of Competency-based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified in an objective statement. Competency-based instruction can be included in conventional instructional settings as well as innovative settings. CBVE does not require self-paced/individualized methods of instructional delivery to be used as the only means for CBVE instruction.

CBVE PRINCIPLES AND CHARACTERISTICS

1. The curriculum is based on well defined, job related tasks or competencies. The curriculum should be designed to have students do things, not just read resources, or view AV materials.

2. Each period or unit of instruction contains a performance objective, stated in terms of observable, measurable activities.

3. Teachers provide students with a list of the performance objectives, the standards to be met and other performance criteria.

4. Teachers may utilize any appropriate method of instruction to present the subject matter to students. Teachers can mix various methods together in any given program, or course, or unit of instruction, to achieve the most efficient means for the students to learn the subject matter and competently perform the task as specified in the objective. Possible methods of instruction used in CBVE programs may include:

   —Group paced lectures and demonstrations.

   —Instructor controlled practice activities.

   —Self-paced instruction for individual learning activities and repeated practice.

   —Small group or team teaching methods where several students work together on a piece of equipment or a project, or activity.

5. Teachers must have a method of recording each student's achievement for each performance objective. This can be in the form of a record book, or a progress chart, a check off sheet, or a series of well planned performance tests.

6. Teachers must inform each student that they have either met the criteria specified for each performance objective or they have not adequately performed the task. The student must be informed of any inadequate performance and provided the opportunity and resources to practice performing the task until adequate performance is attained. This is probably the most difficult aspect of managing CBVE instruction, for it requires the teacher to individually coach or tutor a student for a controlled period of time, requiring the student to practice performing the task several times, and ultimately making the decision that the student is either competent at the task or not competent. The teacher may limit the time allowed for repeated task practice.

7. Student performance is evaluated in comparison to the standards and performance criteria stated in the objective, not to the performances of other students. If performance meets the standard, the student passes the objective 100%. If the student does not meet all the criteria specified, the student is not 100% competent in performance of the task and should not be given credit for completing the task. The student can be given an incomplete grade if continued attempts will be made to pass the objective.

8. Teachers may use both performance tests and written tests to determine competency. Written tests can be used to measure knowledge of performance procedures, equipment identification, math and science abilities, etc. Performance tests can be used for actual student performance of a task, to a prescribed standard, under specified conditions.

CBVE GOALS

The goal of Competency-Based Vocational Education is to have all students reach the specified standard of competency. Instructional methods, quantity of instruction, and performance evaluation methods will vary according to the instructional situation. CBVE instruction allows for the use of a multitude of instructional resources and procedures, including individual self-paced units of instruction to allow the student to master the objective. This approach differs from traditional instruction in which all students use the same materials and spend the same amount of time in a course where student achievement is expected to vary—not the instructional approach.

TEACHER AND STUDENT ROLES IN CBVE

The requirements of competency-based vocational education have major implications for the roles that teachers and students perform and for the kinds of skills that teachers need. In competency-based settings, teachers must not only be dispensers of information; but they must also become managers of a variety of instructional resources that they select and use to tailor instruction to the needs of individual learners. Teachers spend

less time providing content information and much more time helping individuals master objectives. In a competency-based setting, the teacher may present some group instruction as well as develop alternative resources, and function as a tutor and a counselor, a diagnostician of learner needs, a prescriber of instructional experience, and an evaluator of competent performance.

The teacher in this setting has, then, a more complex, varied, and rewarding role than ever before. Teachers need to be able to design their course or programs around measureable, job-related skills and to ensure that these skills are, indeed, necessary for obtaining and keeping a job. They must be able to state objectives clearly and in a way that permits objective measurement. Teachers must be able to carry out this measurement in a way that accurately assesses student achievement and that exactly reflects what the competency really involves.

Teachers must also be able to adapt their instruction to individual learning needs so that each student can acquire the competencies (s)he needs. This ability to tailor instruction demands knowledge of a wide variety of individualization strategies, as well as skill in applying these strategies systematically.

A major assumption underlying CBVE is that students who are actively involved in carrying out their programs of study will learn more and retain more than students who passively accept information fed to them. Thus, an important part of the teacher's job is to encourage students to assume more and more responsibility for their own learning.

Because students are doing many different kinds of things, and because the teacher must coordinate the activities of all the students in a course, the

individual student's role inevitably involves more responsibility than it does in traditional settings.

Many of the basic management tasks that teachers formerly undertook by themselves-tasks such as record keeping, monitoring student progress, and monitoring the use of resources-must become the joint responsibility of teachers and students in a competency-based setting.

Some teachers worry that giving students more responsibility will result in a loss of teacher control. On the contrary, however, most teachers find that the have more control in a competency-based setting than in a traditional, group-oriented setting. The teacher has, after all, designed the system or environment in which students must operate; without the teacher there to manage the overall system, it would soon cease to function.

INSTRUCTIONAL CONCEPTS:

Instruction should be systematic and reflect program goals. A list of competencies and specific performance objectives with criterion-referenced measures should be used.

1. Program Plan

   The training program should progress in logical steps and provide for alternate sequences, where applicable.

2. Student training plan

   A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet each goal. Every student should be given a copy of his/her training plan.

3. Preparation Time

   Adequate time should be provided for teacher preparation and

program development and/or modification.

4. Teaching Load

   The instructor/student ratio and class contact hours should allow time for interaction on a small-group and a one-to-one basis.

5. Curriculum

   a. The specific competencies in the Career MAP Competency List should be included in each area of program-specific instruction. Additional competencies may be added to meet the needs of local employers. All additional competencies should be approved by the program advisory committee.

   b. Instructions on the legal aspects and responsibilities in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts or supplies, and basic record-keeping should be a part of the training program.

6. Student Progress

   A record of each student's progress should be maintained through use of the Career MAP or another type of Progress Chart. The record should indicate the competencies required for mastery and those competencies the student has mastered.

7. Performance Standards

   Instruction should be performance based, with an acceptable performace standard stated for each task. These standards should be shared with students and potential employers.

Students should demonstrate "hands on competency" or "mastery" of a competency before the instructor verifies the student's performance.

8. Safety Standards

Safety instruction must be given prior to shop work and be an integral part of the training program. A safety test must be included in the training program. Eye protection must be worn in any shop/lab area, when required.

9. Personal Characteristics

All training activities and instructional material should emphasize the importance of maintaining high personal characteristics. Employability skills training and evaluation should be integrated throughout the training program.

10. Provisions for Individual Difference

The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accomodated.

11. Related Instruction

Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

12. Testing

Both written and performance-based tests must be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

COURSE OUTLINE/SAMPLE LESSON PLAN

Units of instruction used by Vocational Education teachers must be correlated to the Curriculum Frameworks, and Student Performance Standards. The Curriculum Framework provides the basis for developing the course outline. Each school should utilize the resources and modules that apply to the scope of their program and the various methods of instruction their situation dictates.

Teachers may develop their individual course outlines using the resources and instructional material contained in the last section of this guide. They may also develop their own units of instruction as they feel may be necessary to meet the intended outcomes stipulated in the Curriculum Framework. The number and order of presentation of the modules can be varied to fit the objectives of the course.

For example, a school may elect to go into depth in only a few of the modules, or it may decide to cover a wider range of modules but in less depth. This program can be offered for a single semester or for two or more semesters, depending upon the local situation. A student should not be given credit for enrolling in the same component of instruction more than one time.

SAMPLE COURSE OUTLINE

Vocational teachers should prepare a comprehensive outline of subjects to study for each course they teach. Each student should be provided a copy of the course outline. Teachers may use any format they desire for the outline, and should include the following information on the course outline.

Recommended Course Outline Contents

1. Course name.
2. Course number (state directory number and/or local number).
3. Course start date or individual start date.
4. Identification of time periods for study if applicable.
5. Identification of place or room/facility for study or practical work.
6. Identification of teacher/instructor/assistants responsible for instruction and/or evaluation.
7. Identification of units or subjects to study (objectives) or competencies, etc., including Task # or Duty #.
8. Identification of primary resources or references available to study.
9. Identification of major practical exercise work, projects, or activities to perform.
10. Identification of major tests or examinations to be administered.

SAMPLE COURSE OUTLINE FORMAT

Course Name _____

Course Number _____

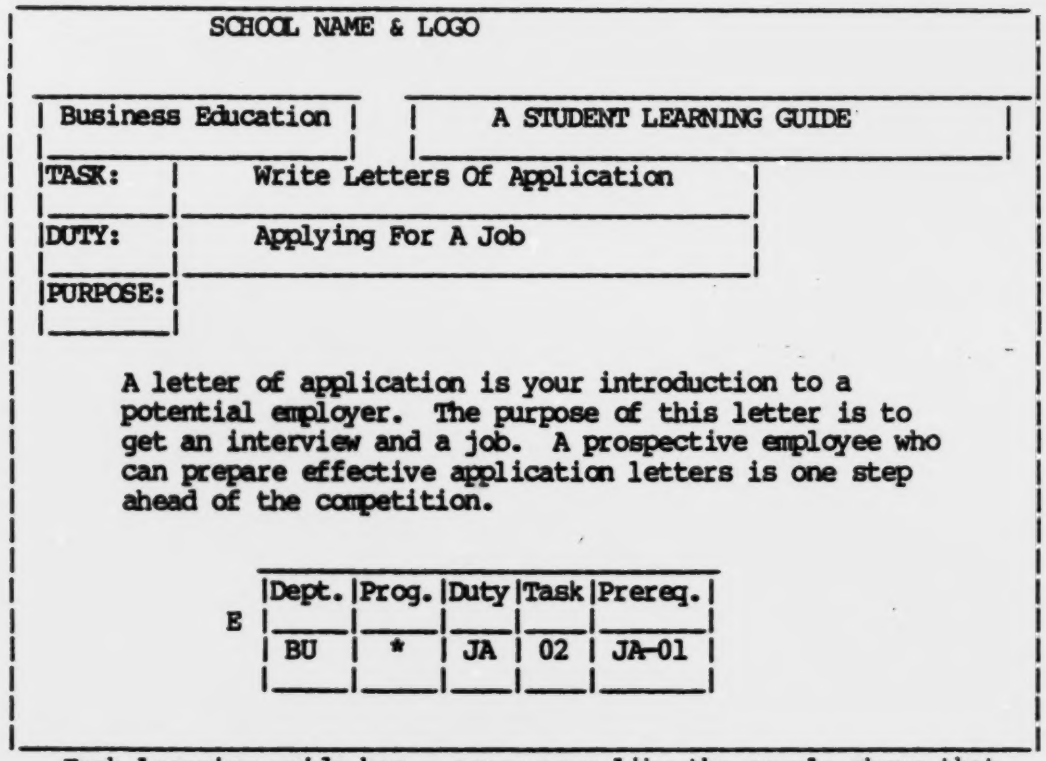
Course Dates _____

Instruction unit or period	Duty or Task # Module	Subject/ Objective/	location	Instructor	Reference

Lesson Plans/Teachers Guides & Student Guides

Teachers should prepare lesson plans or teachers guides & student guides for subjects on the course outline. Lesson plans are appropriate for traditional periods of instruction whereas teachers guides may be more appropriate for other types of instructional activities. Student learning guides may be used for traditional periods of instruction but they become a necessity for self-paced learning activities. Teachers guides contain all instructional information as well as tests & answer keys, whereas student learning guides contain only student information.

A sample student learning guide is provided in the following pages. This sample is an example of the material a teacher would provide students with for self-study in a competency-based course activity. Each page of the sample contains a different topic for the sake of illustration only. An actual student learning guide would be written around only one objective.



Each learning guide has a cover page like the sample above that contains the following items:

A. the name of the program

B. the task-a statement of exactly what you will be able to do or know when you complete the learning guide.

C. the duty-the broad unit in which this task is found.

D. the purpose-a statement of why it is important to attain the task.

E. identifying information such as department, program, duty, task, and prerequisite. The prequisite in the box on the far right tells you that you must have already attained the task identified there before proceeding to attain the one in the present learning guide.

STUDENT PERFORMANCE OBJECTIVES:

A TERMINAL PERFORMANCE OBJECTIVE:

B GIVEN: plans and a residential site.

C YOU WILL: construct and set forms for a continuous footing.

D HOW WELL: You must successfully complete the Written Test and score 100% on the Performance Test.

ENABLING OBJECTIVES:

1. Identify styles, uses and parts of forms.
2. Prepare for constructing continuous footings.
3. At a school work station, construct and set forms for a continuous footing.

E

Dept.	Prog.	Duty	Task
IN	9163	F	01

The student performance objective page, similar to the sample you see above, contains the following information:

A. the terminal performance objective (TPO)-the broad heading that encompasses the three items beneath it and states in detail what will be expected of you at the end of the learning guide

B. the given-a statement of what will be provided when you take the written or performance test

C. the you will-a statement of what will be required to attain the task

D. the how well-a statement of the degree of performance excellency required to attain the task

E. the enabling objectives (EO's)-the steps to be taken in attaining the task

A ENABLING OBJECTIVE NO. __2__

B Disassemble fuel injector and inspect parts.

C LEARNING STEPS	RESOURCES
1. Disassemble injector.	1. a. Needle valve injector b. Mechanic' tool set c. Injector tools
2. When completed, evaluate your work using the Self-check.	2. Self-Check enclosed
3. Have instructor evaluate your recordings.	3. Instructor
4. Go on to Enabling Objective No.3.	

E

Dept.	Prog.	Duty	Task	EN.OBJ.
IN	9123	C	05	2

The enabling objectives are the heart of the learning guide. They provide detailed steps of what to do and when to do it.

There is an enabling objective page for each EO listed on the student performance objective page. The EO page resembles the sample above, and contains the following information:

A. the number of the EO being learned

B. a restatement of the EO as it appeared in the student performance objective

C. the learning steps-they tell you what to do

D. the resources-they tell you what items you will need to complete the steps

INSTRUCTION SHEET

Mounting Tires

Follow the procedure below for mounting a tire on a rim. Pay close attention to all safety precautions.

CAUTION: WEAR SAFETY GLASSES AT ALL TIMES!

1. Visually inspect tire for any wear or damage.
2. Place the rim on the changer with the narrowest flange up — hand tighten centering cone.
3. Lubricate bead of tire with soap solution.
4. Place tire in position on the rim with as much bead over the rim flange as possible. This provides a starting position for bead lifting tool.
5. Attach the air hose for inflating the tire.

CAUTION: KEEP THE HANDS AND BODY AWAY FROM TIRE WHILE INFLATING. IF THE TIRE SHOULD EXPLODE YOU COULD BE INJURED!

Dept.	Prog.	Duty	Task	En Obj
IN	9043	B	02	2

The procedure in using the EO page is to follow each learning step in sequence. The first several learning steps will tell you to read or view particular resources identified to the right of the step (see #2 on the sample EO page). Other learning steps will ask you to practice or apply the knowledge or skill (see #3 on the sample). Another learning step will identify the type of feedback used in evaluating the skill or knowledge called for in the EO. Often this is a self-check (see #4 on the sample). Some learning guides will have instruction sheets on the order of the above sample.

SELF-CHECK

DIRECTIONS

Evaluate your work using the items listed below. All items should receive a "yes" response.

	YES	NO
1. Was the stocked area layed out with a pencil and chalk line?.....	___	___
2. Did each end of the stock area begin with a stack of blocks?.....	___	___
3. Was the line hung on the left lead first?...	___	___
4. Was the line hung in 45 seconds?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

Dept.	Prog.	Duty	Task	En Obj.
IN	9133	B	18	2

The self-check gives you immediate feedback on how well your learning is progressing.

WRITTEN TEST FOR TASK NO. ____

TASK: Demonstrate and use Ohm's Law

Directions

The purpose of this test is to determine if you fully understand how to demonstrate and use Ohm's Law. To successfully complete this test, all items must be answered correctly.

The items below are Multiple Choice. On the separate answer sheet, put the letter of the correct answer in the blank to the left of the number of the question.

Multiple Choice Question

____ 1. According to accepted theory, electric current is:
a. the electron at rest. c. the movement of atoms.
b. the flow of electrons. d. the movement of protons.

____ 2. The ohm is the unit of electrical:
a. current. c. pressure.
b. voltage. d. resistance.

Dept.	Prog.	Duty	Task
IN	9273	B	02

PERFORMANCE TEST FOR TASK NO._____

TASK: | Perform Cash Transactions

_____ _____
STUDENT'S NAME DATE

DIRECTIONS TO STUDENT: In a store situation, you will set up a till and place the currency in the proper place. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" Response.	YES	NO	
1.	Were all bills placed in the proper slot?.....	...	..	.....
2.	Were all coins placed in the proper compartment?.	...	..	.....
3.	Was the work area cleaned?.....	...	..	.....

_____Score ___Attained
___Not Attained

Dept.	Prog.	Duty	Task	Attempt
DE	4623	C	03	

_____
EVALUATOR'S SIGNATURE

The performance test is always the last page of the learning guide. It may identify checkpoints of evaluation in the performance of skill, or it may list desirable characteristics of the finished product.

**Example of Student Learning Guides taken from : Learning at Ridge Vocational Technical Centers, State of Florida, Department of Education, Division of Vocational Education; June, 1980.

STUDENT ORGANIZATION PARTICIPATION

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The Florida Board of Education Rules authorize vocational student organizations as an integral part of the vocational education program SBER 6A-6.64 (7) and 6A06.65 (8).

Vocational Student Organizations are operated throughout the Nation on the basis of legal endorsement, financial support, and active participation of federal, state and local levels of government as well as the civic and business communities.

Vocational Student Organization Activities are an integral part of the vocational curriculum in Florida. The organizations are designed to expand and enrich opportunities for leadership development, social awareness, civic responsibility, and vocational understanding.

Students who participate in the activities of a vocational student organization are better prepared to take their places in the world of work. They acquire firsthand knowledge of the many opportunities available in their chosen careers, and become aware of the value of their contributions

to society.

Vocational student organizations provide opportunities for members to participate in activities which relate to actual or anticipated employment. Students develop and utilize their talents and abilities in ways that otherwise could not be available to them.

Vocational Industrial Clubs of America (VICA)

The Vocational Industrial Clubs of America (VICA) is an organization for students enrolled in trade, industrial, technical, and health occupations in high schools, area vocational-technical centers, and junior and community colleges.

VICA promotes high standards in work ethics, craftmanship, scholarship, and saftey while it fosters a deep respect for the dignity of work. In addition, the precepts of VICA help students relate school experiences to their search for meaning, identity, and achievement. A great deal of emphasis is placed on the functions of labor and management organizations, their interdependence, and their importance.

VICA members learn and develop skills in many different trades, including building, automotive, mechanical, heavy equipment, and electrical. In addition, students in such personal service occupations as cosmetology may be a part of VICA.

Prestige and recognition are offered to the VICA member through a local, regional, state, national, and international program of competition and

awards. Opportunities to develop personal leadership skills are provided through workshops and seminars while competitive activities help to develop the students' perspectives.

Membership in VICA helps students learn to work together and prepare for life through a continuing emphasis on the importance of each person's role as a contributing member of American society.

What is VICA?

VICA is an organization for students enrolled in fulltime secondary or post-secondary trade, industrial, or technical occupations education programs. It is the only national (and international) organization for trade and industrial students.

VICA gives every member a chance to learn, to enjoy the interaction with other students, to assist their schools and communities, and to grow and mature in qualities necessary to meet the challenges of the life ahead of them. VICA members are no different from other students except that they have found a way to make their formal training and education an enjoyable and rewarding experience. They're "turned on" to the satisfaction, rewards, and fun they have found in VICA.

VICA is the students' organization; the goals, purposes, and activities that relate to their own personal career goals and life interests. VICA is for students with a definite future in mind—people who can think with their minds and work with their hands, people who are proud of their work they do and want to learn to do it better. VICA is for those who want to develop as

members of society, to learn to express themselves, to work with others, and to make contributions as individuals.

VICA is YOUR organization.
VICA is much more than contests.
VICA is training youth for leadership roles
within their schools and communities.
VICA is instilling in youth the importance of participation,
within their school, within their community and within the
student organization.
VICA is also participation in leadership and skill areas.
A good VICA program gives Industrial Education programs
high visibility.

Contests at the local-club level determine which students shall represent their school in regional competitions. Instructors should plan and conduct contests within their trade areas. This philosophy shall also prevail for leadership areas of emphasis. (Successful competitors at local school levels may, in school districts so desiring, compete within the district. THIS IS A SCHOOL DISTRICT OPTION.)

Successful competitors at the local school level compete at one of Florida's five regional contests. Successful competitors next compete at the state level. The state winners compete on the national level, in the United States Skill Olympics.

Competitors for the International Skill Olympics (ISO) are determined by a

combination of leadership and skill abilities. The International Skill Olympics Committee establishes all rules and guidelines for the ISO.

The following additional criteria will be used in the selection of International contestants:

a. Overall citizenship—as demonstrated by attitude toward school, occupation, VICA, additional training, etc.
b. Evaluation of progress in skills and knowledge of trade, metric applications, print reading, and layout of problem.
c. Personal desire to represent VICA and the United States in international competition.
d. Willingness to make a commitment to VICA as to purpose of organization, code of conduct, preparation time, etc.
e. Contestant's self-reliance, basic intelligence, ability to follow instruction, maintain schedules, and adapt to last-minute changes.

Local VICA Organization

1. School Club

   Each school is one club (with one charter). A "school" shall be defined as one that appears with an assigned number in the current Florida Directory.

2. Chapters

   In the event that a school has a multiple sessions, each session shall be identified as a "chapter" (example- morning session identified as chapter #1, afternoon session chapter #2, evening

session chapter #3, etc.).

3. Section

Each occupational program within each chapter shall be identified as a "section" (example- auto mechanics, welding, cosmetology, etc.).

Organizational Structure

Conducting a local club activity is the responsibility of every member. Every member must have a function to perform. A balanced organizational structure is necessary to equalize the workload as well as to pinpoint responsibility. When the students know what is expected of them, they can better use their abilities to plan and execute their own activities and , at the same time, grow in leadership ability. An effective organizational structure allows for the mixing of people and personalities, which is good human relations training.

It is a good idea to make a poster-size (or larger) organizational chart, to display it on the bulletin board, and to duplicate smaller copies of the chart so each member may have a copy. Members are less likely to shirk their responsibilities when all members are aware of everyone's assigned duties. Advisors must be careful to enforce the chain of command in all decisionmaking situations.

The national organizational structure shows the relationships of the local, state, and national organizations. It is important that every member understand just how the total organization functions. See VICA

Organizational Diagrams at Appendix B.

Intergrating VICA and Instruction

What is meant by the phrase "Integrating VICA and Instruction?" Some teachers feel that integrating VICA activities in between their instructional activities (in printing class, slotting VICA between a unit on the offset press and a unit on stripping) is best. Then there is always the teacher who says,"Look, nothing really happens Friday afternoons anyway, so I will slot VICA activities in on Friday afternoon. We will have our 5-minute VICA club meeting and that will satisfy the talk about integration of VICA activities into the instructional program."

This is not what we are talking about. We are talking about VICA being an integral part of everything that happens inside the classroom.

You may wish to secure and study the slide-tape program "Integrating VICA and Instruction" that is available from your Regional Program Consultant or Regional Program Advisor. You also may wish to purchase the set.

In-school instruction involves the organized presentation and application of knowledge, skills, and attitudes. Laboratory occupational experiences require the individual student to apply, in a simulated work setting, the knowledge, skills, and attitudes acquired through in-school instruction. VICA activities are part of in-school instruction and laboratory occupational experiences. Integrated club activities improve and tie together the existing curriculum.

VICA is specifically for Vocational Instruction Education. The activities of a chapter can be part of the learning experiences planned for any vocational class. Vocational education classes such as welding, foods, drafting, and auto mechanics can utilize VICA as a teaching tool. Any student who is enrolled in Vocational Industrial Education and meets membership requirements can be a member of a VICA club.

Job skills and procedures are often well defined and structured in the vocational programs. For example: in individual vocational courses, such skills as drawing to scale in drafting, tuning a motor in automobile mechanics, and keeping production records in a vocational printing course are taught. Although such skills are often taught at all levels in vocational education, the attitudes and values that promote employability and employment stability often are neglected parts of structured skill-oriented vocational programs. For example: learning experiences dealing with such activities as getting along with coworkers, accepting constructive criticism, or taking orders might not be as easily dealt with or integrated into skill-oriented, vocational courses. (See chart below.)

CLUB ACTIVITIES PROVIDE EXPERIENCE
THAT LEAD TO EMPLOYABLE
SKILLS AND ATTITUDES

1. Getting along with co-workers.
2. Respecting authority.

3. Accepting criticism.
4. Respecting the rights dignity of others.
5. Meeting deadlines.
6. Working with supervisors.
7. Taking directions.
8. Communicating clearly.
9. Taking initiative.
10. Being punctual.
11. Assuming responsibility.
12. _____
13. _____
14. _____

Being an Effective Advisor

The effective advisor believes in student-directed learning, is organized, and is flexible in planning. The effective advisor works to become a respected person in the community, thereby building support for VICA activities. The effective advisor blends the classroom world with the "working" world and associations, and involves students with business, professional, and community leaders. The effective advisor promotes enthusiasm. For these efforts, the effective advisor receives a lifetime of psychological rewards.

The following club/classroom activities from the teacher/advisor viewpoint,

should make being an advisor easier.

---

1. Advise and guide; do not dictate.
2. Positively assume that club activities are going to succeed. Know that club activities are strong teaching tools. Show enthusiasm.
3. Establish basic ground rules that help students to lead themselves. Hold meetings regularly and conduct meetings in a business-like manner.
4. Organize activities. Set up club files and a library of club-related materials.
5. Remember that club activities are individual and group activities and are NOT teacher activities.
6. Use students as class leaders.
7. Develop professional slide presentations about club work in classes.
8. Develop an informational packet to use with the community and other school personnel. Include such things as curriculum outlines, training plans, national headquarter promotions, calendars of work, etc.

Necessary Groundwork—Selling the VICA CLUB

Selling club activities to the department chairman, school administrators, and the community is an important first step in the organization of a club.

You may be told that there can be no clubs in the classroom and that few students join any more. Keep in mind that the VICA organization is not a club in the traditional sense. With ingenuity, a club can work in any situation in spite of rigid rules. Stress that VICA is INTEGRAL TO THE TOTAL PROGRAM AND SHOULD BE CONSIDERED A VERY IMPORTANT TEACHING TOOL IN AND OUT OF THE CLASSROOM/SHOP. Some suggestions on how to sell club-work are included below.

1. Discuss ideas. Don't spring the idea of an integrated club on people whose support will be needed.
2. Inform people about the state and national organizations by handing out and discussing promotional materials.
3. Make starting a VICA organization part of the agenda of the Craft Advisory Committee's meeting. Present your proposals to this group. Let the committee work with students to plan a program of activities.
4. Survey students on their interests in club activities. Compile and distribute results.
5. Check course outlines to see how club activities can fit in. Add these activities to lesson plans.
6. Relate the school philosophy to the national VICA Organization's goals, purposes, and program of activities.
7. Project the number of resource persons that students would contact in the community who would be up-to-date experts in certain areas.
8. Identify the club as an important public relations tool.
9. Show how club activities are important motivational projects

that promote student-directed learning.

10. If necessary, point out the benefits of club activities in relation to the relatively low cost-per-student.
11. Confer regularly with those in charge, i.e., department chairpersons, officers, and school administrators.

STUDENT ADMISSIONS CRITERIA

INTRODUCTION

Leading the individual student to successful completion of a vocational education program—in either a secondary or a post-secondary institution—should be the only major concern of a school's teaching effort. It is, therefore, of the utmost importance to direct thought, planning, and effort into identifying and selecting students with excellent potential for success in the educational program and in the industry. The school's primary task is to prepare people for full-time, entry-level positions as technicians or, in the case of those with more experience, as managers. Recruiting efforts will, of course, vary from school to school depending upon level (secondary or post-secondary), courses available, and local needs.

Students enrolled in an occupational cluster should be able to benefit from the instructional content therein with reasonable expectations for employment upon successful program completion.

In accordance with the Course Code Directory, an occupational program is offered to students at grade levels specified therein. The specific student admissions criteria required by the state and local education agencies are identified below.

SPECIFIC ADMISSIONS CRITERIA

	SECONDARY	POST-SECONDARY
Minimum age:	n/a	n/a
High School Diploma or GED Required:	no	yes
Physical Requirements:	none	none
Special Requirements:	none	none
* Minimum Basic Skills Math Level:	n/a	7.0
* Minimum Basic Skills Language Level:	n/a	7.0

*This grade level number is specified in the Curriculum Framework and is derived from a state basic skills examination.

In addition, attention should be focused on other personal qualities that, in theory, may be subject to improvement within a training program but, in reality, may prove to be serious impediments to success. Typical would be deficiencies in communications and mathematical skills. Such skills should be measured by tests and the results used as a screening guide or as a basis for providing additional program requirements.

THE STUDENT PROFILE

It is difficult to find an "ideal" student. Many will apply for a place in various training programs. The question is: How can students with the most potential for success be selected?

To attempt to draw a profile of the ideal student candidate would be

fruitless because the ideal candidate cannot be defined in a manner that would fit all localities, nor even in such a way as to fit all situations in a single locality. Nevertheless, it is appropriate for the Craft Advisory Committee and the school system to develop a profile as a basic guide, with the certain knowledge that supplying candidates at any given time will necessarily entail compromise.

Rejecting high school students requesting admission to a vocational program would probably not be permitted in any school system in the nation. Even if students could be screened, it would be difficult to determine which would be successful. In a high school program, it may be best to accept as many students as possible and let their abilities surface in the first year or two. It may then be possible to place the strongest students in a vocational "capstone" course in their senior year, either for employment upon graduation or as a necessary prelude to admission to a post-secondary program. Obviously, this is not a perfect solution; but in the real world, perfection is rare.

The community college should make a greater effort to enroll the "ideal" student. This may be done through a process of screening "all comers" or by consciously recruiting potential students with known qualifications. In either case, the school and the Craft Advisory Committee will need to draw a profile of the desirable student. The profile will contain a list of qualities, traits, and aptitudes that combine to make a potentially successful candidate. Since few of these qualities are completely missing in any one person, acceptable levels must also be determined. The qualities deserving of highest attention—mechanical aptitude, for example, or native

intelligence—are those which the educational program itself is unlikely to be able to change. Accordingly, such matters should carry considerable weight in establishing the basic profile. Other matters—deficiencies in mathematical or communications skills, for example—may lend themselves to improvement through related instruction, even though they are not parts of the training program per se. Following is a list of specific qualities the Advisory Committee and school staff should consider when establishing the student profile:

MECHANIC/TECHNICIAN—SERVICE

—Knowledge of basic tools and equipment used by mechanics/technicians

—Aptitude needed to think through and solve mechanical and technical problems;

—Ability to understand written mechanical/technical materials;

—Ability to interpret mechanical/technical drawings;

—Mechanical dexterity.

MECHANIC/TECHNICAL SERVICE MANAGEMENT

—Basic knowledge of service;

—Business skills;

—Ability to work with people;

—Communications skills;

—Leadership.

QUALIFYING AND PRETESTING

The process of qualifying a potential student for training must be an integral part of the recruiting process. Considerable amounts of time and money will be spent on students entering training. There must be some assurance that they are receptive to, and capable of benefitting from, the training that will be provided.

In the normal process of recruitment, recruiters will have some idea of the candidate's basic traits and capabilities. Whoever guides the candidate to the program will also have some knowledge of the person's interests, abilities, and experience. These perceptions should be considered by school admissions officials.

Care must be taken, however, to assure that highly favorable early-interview impressions—or negative impressions, for that matter—do not prejudice the final decision. Determination of the candidate's potential for success can be greatly aided by pre-school testing. Such tests can yield reliable clues to certain characteristics, such as mechanical aptitude, that are essential. The tests can also tell a great deal about the candidate's present knowledge and skills. These, in turn, can help determine how much and what kind of training each individual should receive.

Despite the efficacy of many tests, a caveat should be noted. Standardized testing has come under fire, in recent years, from many quarters. It has frequently been charged, for example, that some standardized tests are

culturally biased and, consequently, favor one group in society over another. Those charged with responsibility for admissions should be aware that testing, while it can often provide valuable insights, should never be the sole criterion for admissions.

COUNSELING AND GUIDANCE

Counseling is a two-fold activity. Its first use is to guide the qualified, prospective student into the program; its second is to help the enrolled student on a continuing basis throughout the program.

Entry into a program does not cause all student problems to vanish; each student will encounter new problems as the program unfolds. The counselor's job is to work with the student to help identify problems and then work toward their solution. The counselor must also constantly watch for signs of discouragement or loss of interest and attempt to determine their causes.

Much day-to-day counseling will necessarily fall to the teacher. The teacher has the most contact with the student and is often in a position to detect and correct a problem while it is small. Overlap of responsibility between teacher and counselor should be apparent. The importance of working together in this critical area cannot be overstated.

The professional counselor cannot be expected to have the expertise of the teacher. The teacher will therefore provide much of the counseling that focuses on trade knowledge and skills. The counselor, on the other hand, will focus on the student's needs for advice on related instruction and in

connection with personal growth, interests, and attitudes. In large programs, at least one counselor with deeper knowledge of the industry should be available.

STUDENT PLACEMENT

Placement will not be a factor with some students, such as those currently employed in the industry. A student from industry, even if in school by personal choice, is likely to have a good idea of where to go when the program is completed. The school placement program should, of course, be as available to these students as to anyone else.

The placement program, for the most part, will serve students who enter with little or no experience in, or contact with, the industry. Many such students will develop industry contacts during the course of instruction, particularly if a cooperative program is offered.

It is logical to center placement activity at the school. The school has an organized placement office for other occupations.

The tasks of the placement official is to fit graduating students to job openings in the community. Identifying graduating students is a simple task, but the placement official will also need to know something of each student's personal aims and interests in addition to what is on the achievement record. The placement official should develop a form that will provide this information in simple format for easy reference. The placement official, the counselor, and the teacher should assist students in the

preparation of effective resumes.

Input concerning employment openings is somewhat more difficult to organize. Such input must come from individual service establishments in the community. Each job listing should include as much detail as possible about the work involved. A standard form for this purpose will facilitate matching an applicant to a job.

The placement official should attempt to expose a given student to as many suitable job openings as possible. Conversely, employers should be exposed to as many qualified candidates as possible. The placement official should take special pains to avoid matching up an applicant and a job that are obviously not suited to each other.

The final fit of placing technicians in an appropriate job is the joint responsibility of the student and the employer. The success of this final decision will be greatly enhanced when both student and employer have numerous interview opportunities and as wide an area of choice as possible.

The role of the Craft Advisory committee in placement is two-fold:

—To work closely with the school in establishing an adequate placement function and to evaluate its performance on a continuing basis;

—To work closely with all industry establishments in the community to encourage them to use the school's placement

office; to provide adequate job information to the placement office; and to develop an effective procedure for interviewing and evaluating potential employees suggested by the school.

If the need for competent technicians is as great as claimed, and if the educational program performs in such a way as to produce qualified technicians, the failure of local service establishments to follow through with job listings and effective interviewing and hiring practices can seriously impair the ultimate success of the program. It is up to the Advisory Committee to make certain that student placement proceeds in a smooth and effective manner.

TEACHER CERTIFICATION AND QUALIFICATIONS

QUALIFICATIONS

The Teacher is qualified to teach by one of the following methods:

1. Regular or temporary Florida teacher's certificate with appropriate coverage;
2. Approval of local school board consistent with adopted school policy; or
3. Regular or temporary Florida teacher's certificate with other than appropriate coverage; has met all occupational experience requirements prescribed as a prerequisite to appropriate certification, and has been approved by the school board to teach out-of-field.

Refer to the Curriculum Framework for this program to determine the certification coverage for this program.

INSTRUCTIONAL STAFF

It is recommended that the instructional staff have technical competency and meet all state and local requirements for certification.

1. Technical Competency

   Instructor(s) sould have demonstrated technical competency and should hold current, nationally recognized certification in the laboratory areas taught. Instructors should hold current, nationally recognized certification, if awarded.

2. Instructional Certification

   Instructors should meet all state certifying requirements.

3. Technical Updating

   Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructor(s) to return to industry on a regular basis for in-service and skill upgrading.

4. One or more instructor(s) in each department should hold a current American National Red Cross Standard First Aid Certificate.

5. Substitutes

   A systematic method of obtaining "substitute" or "supply" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instuctor in the occupational area and specific competencies taught.

FACILITY DESIGN CRITERIA

INTRODUCTION

Even the best instructor should not be expected to turn out competent and immediately productive graduates if they are forced to learn with out-of-date, improper, or inadequate facilities, tools, and equipment. Planning for and providing the proper facilities, tools, and equipment are difficult parts of establishing a training program, especially when space and budgetary constraints are considered. Facilities, tools, and equipment should be adequate to meet teaching objectives.

This section of the Program Guide contains guidance for setting up classroom activities as well as lab or shop facilities. Diagrams of typical classroom and shop layouts are contained in Appendix A.

REAL-LIFE FACILITIES

The training facility cannot duplicate the real-life facility in which the student will work after graduation. However, the more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies, and test equipment should conform to local industry usage. Although different facilities may utilize different makes of tools and equipment, the actual differences in operation of most equipment are usually not so great. The on-the-job training each graduate will inevitably receive will usually reconcile

differences between equipment used in the school and that in the commercial shop.

TEACHING FACILITIES

Additional facilities and equipment will be required that are peculiar to the teaching job itself. Among the more important are:

Classroom space;

Audio-Visual Equipment—motion picture, slide, filmstrip, and overhead projectors; videotape units; microfiche readers;

Special devices to demonstrate basic principles and theory;

Duplication of tools and appropriate equipment to enable several students to work individually on the same service operation;

"Live Work" area(s) or laboratory facilities.

A superior instructor could no doubt make do without much of this equipment. But the availability of state-of-the-art training devices enhances the effectiveness and efficiency of any classroom.

Efficiency means achieving instructional objectives in the shortest time possible. By reducing training time and lost motion, the "return on investment" of the facility increases, competent maintenance persons enter

the industry more quickly, and the individual student initiates a career and begins producing personal income sooner.

UPDATING FACILITIES

Facilities and equipment need updating just as curriculum, course content, and instructor capability do—and for the same reasons: technological change and improvements from year to year. Updating facilities and equipment may be more costly than updating course content—but failure to do so, at least minimally, will almost certainly impair the effectiveness of the program in a relatively short time.

DETAILED FACILITIES ANALYSIS

The advisory committee can assist the school in establishing priorities for installing facilities, tools, and equipment. Some are necessary; others are advantageous; and some can be considered nice to have, but essentially unnecessary. Careful planning and analysis of needs over several years can, however, lead to the establishment of a first-rate facility in almost any community.

FACILITIES ORGANIZATION

In planning adequate facilities, one of the more critical considerations—and one that is far too often underestimated—is providing adequate space to meet the changing needs of the instructional program. Buildings should be

designed and constructed for future expansion.

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general shape of the facilities, the number of specialized areas depends, to some extent upon the preferences of staff. However, a few fundamentals should be kept in mind:

Convenient location of entrances and exits;

Easy access to and among service benches;

TRAFFIC FLOW

The overall layout of the service facility should be planned so that the location of entrances and exists permits a logical flow of work in progress. The arrangement of benches to obtain an efficient traffic pattern is one of the most critical factors in planning a facility.

PERSONAL TOOL/EQUIPMENT STORAGE AREA

A student tool storage room or area should be provided, with adequate shelf space for tool boxes and floor space for equipment. This area should afford maximum security for student tools.

ADDITIONAL FACILITY CONSIDERATIONS

1. Training Stations

   Training stations and live work areas must be available in the type and number required for the performance of the tasks outlined in the program goals and performance objectives.

2. Safety

   The facilities must meet all applicable safety standards.

3. Maintenance

   A regular facilities maintenance program should be used to assure facilities are suitable when required for instruction.

4. Housekeeping

   The classroom, laboratory, and support area(s) should be kept clean and orderly.

5. Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

6. Instructional Area

A classroom convenient to, but separate from, the laboratory area should be available for instruction and other non-shop activities.

7. Storage

Storage areas for tools, parts, supplies, and machines must be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

8. Support Facilities

Restrooms, clean up areas, and lockers should be provided convenient to the instructional area.

9. Ventilation

If required, an adequate fume removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

10. First Aid

A first aid station must be in place, well marked, and complete with appropriate supplies.

11. Facility Evaluation

The advisory committee should be asked to conduct an annual evaluation of the facilities to assure adequacy to meet program needs.

SUGGESTED EQUIPMENT LIST

MARINE MECHANICS

QUANTITY	ITEM DESCRIPTION
2	Grinder, Pedestal 1x8 in.
1	Drillpress, 15 in.
1	Press, Arbor
1	Clamps "C", Set of 5
1	Analyzer, Engine
1	Tester, Distributor
1	Battery charger
1	Tester, Volt-Amp
1	Tester, Gen-Alt
1	Tester, Rect-Diode
1	Tester, Trans-Reg
1	Tester, Tack-Dwell
1	Plug Cleaner & Tester
1	Ignition Simulator
1	Valve Grinding machine
1	Balancer, Wheel Off
1	Marine Hoist Lift
1	Press, Hydraulic 25 Ton
1	Steam Cleaner
1	Parts Cleaner
1	Crane, Portable
1	Jack, Floor 2 Ton
1	Bench, Maple 30 in. x 60 in.

1	Bench, Steel 30 in. x 60 in. w/sides
1	Regulator, Oil & Water
1	Welder, arc, 250 amp AC/DC
1	Hammer, chipping
2	Helmets, arc welding
1	Welding & Cutting Outfit w/cylinder regulators
1	Hand truck for gas cylinders
1	Goggles, acetylene welding
1	Small Engine Set
1	Lube Set
1	Can set
2	Electric Drill Set
1	Sander, Disc, Portable
2	Vacuum, Shop
6	Adjustable Wrench Set
1	Hammer Set, Compothane
3	Tool Board, Hammer Set
3	Screwdriver Set
2	Screwdriver set (offset)
1	Punch & Chisel Set
1	File Set
1	Tire Tool Set Board
2	Planning & Inspection Tool Board
2	General Mechanic's Tool Set
1	3/8" Drive Socket Set
1	Screwplate, 1/4" - 1/2"

1	Measuring Set
3	Metric Tap & Die Set
	Assorted Paints
	Wood Dough
	Caulking (wicking and seamlast)
	Sealants
	Fastenings (assorted screws and bolts)
	Staples and Gun - Bostitch T5 or Equivalent
	Plywood (species needed)
	Lumber (species needed)
	Rivets
	Assorted Gauges of Aluminum
	Solder & Solder Gun
	Aluminum Angle Assortment
	Masking Tape
	Wet and Dry Sandpaper
	Rubbing Compound
	Vinyl Sheet
	Parting Film
	Glass, Cloth, Mat, and Roving
	Resin, Catalyst, Cobalt, Gel Coat Patching
	Solvent
	Epoxy Resin
	Mobile Tool Chest
	Vacuum Cleaner
	Fire Extinguisher (A,B,C,D type)

Vise (as required)

Wash Sink

Safety Tool Wash Tank

Work Bench - Resin & Filter Storage

Glass Storage - Cutting Table

Eye Wash

Refigerator (catalyst storage)

Fan

Dry Spray Booth w/Spray Equipment

Mobile Hoist

Waste Can

Band Saw

Heat Lamp & Stand

Set of Bucking Bars

Tin Snips

Carpenter Tool Set

Disk Sander

Silver Knife & Scissors

Paint Storage (check local regs.)

THESE ARE IMPORTANT MARINE SHOP FEATURES

Mono-Rail & Mobile Hoists

Test Tank & Davit

Test Wheel Rack

Wash Rack

Special Tools Board or Cabinet

Mobile Motor Racks

Electrical Repair Bench

Utility Bench

Estimate Rack

Motor Work Benches & Stands

Shop Desk & File Cabinets

Tank & Hood Storage Area

Small Tool Storage Rack

Drill Press & Arbor Press

Grinder Motor With Scratch Brush

Mobile Battery Charger

Air Compressor

Fire Extinguishers

Waste Cans

Back-up Test Tank

SAFETY

The Florida State Board of Education establishes rules for the operation of public schools. Part III, Section B, Chapter 6A-2 of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage, and illumination.

Specifically, subsection 6A-2.97, which follows, contains regulations unique to Vocational classes.

S.B.E. Rule 6A-2.97: Safety devices in shops, laboratories, and other process areas

(1) Use of personal protection devices and other protective equipment is required when students and staff are exposed to the following:

(a) Arc welding, heavy gas cutting, scarfing
(b) Spot welding, brazing, or cutting
(c) Machining of any materials causing flying chips
(d) Injurious radiations, dusts, fumes, gases, vapor mists
(e) Sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body
(f) Chemicals, acids, caustics, and molten metals

(2) Personal protection devices which come in contact with the skin shall be sanitized after each use.

(3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.

(4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

(5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.

(6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.

(7) Welding operations shall be located in a shielded area, and

the area shall be free of combustible material and persons not wearing protective devices.

(8) Areas where toxic fumes are produced shall be properly vented to the outside.

(9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof motor-driven equipment with filters in place.

(10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.

(11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one or more conspicuously color-coded disconnect switches at convenient locations throughout the space.

(12) Kilns shall be properly shielded from combustibles, combustible surfaces, and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.

(13) Automotive, body, and frame repair areas requiring welding and cutting shall be separated from engine overhaul and

related fuel handling activities.

(14) A tire cage shall be provided when pressurizing tires on split rims.

(15) Vehicle lifts shall be provided with a mechanical safety lock.

(16) Piping and working machinery with component parts shall be safety color-coded in accordance with ANSI Z53.1-1971.

(17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.

(18) Hazardous work and storage areas shall be identified by appropriate caution signs.

(19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.

(20) Safety zone lines shall be used on the floor area surrounding working machinery.

(21) Fume hoods shall be provided and kept in proper operating condition. Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in the

fume hoods.

(22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided, properly installed, and maintained correctly.

INSTRUCTOR RESOURCES

LEARNING RESOURCES

Support material consistent with both program goals and performance objectives should be available to staff and students.

1. Service Manuals

   Manuals with current manufacturer's service procedures and specifications. These manuals must be located where students can use them while working in the shop area.

2. Multi-Media

   Appropriate up-to-date multi-media materials such as flip charts, tape slides, motion pictures, overhead transparencies and video projection media should be decentralized, readily available wherever possible, and utilized in the training process.

3. Instructional Development Services

   The services of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication of

printed material and overhead projector transparency development. Instructional development personnel should conduct in-service workshops and/or other training in curriculum and media development on a structured basis.

4. Periodicals

Current general and technical magazines and newspapers should be available for student and instructor use.

5. Student Materials

Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Where textbooks are used, specialized texts should carry a copyright date no older than 3 years, basic texts no older than 6 years.

PRINTED AND AUDIOVISUAL MATERIALS

This list contains an extensive number of organizations providing training materials. Some materials are free; for others, there is a charge. Details should be requested in writing prior to ordering.

TEXTBOOKS

1. Florida State Department of Education, Vocational Division. Teaching Academically Disadvantaged Students in Vocational Education Courses, #DD012 BK-82.

2. Florida State Department of Education, Vocational Division. Keys to Managing Competency-Based Instruction, #TE036 BK-77.

3. Florida State Department of Education, Vocational Division. Guidelines For The Review and Selection of Instructional Materials for Competency-Based Education, #TE034 BK-80.

4. Florida State Department of Education, Vocational Division. Employability Skills Series, #CE001 SS-81. (CE003, CE004, CE009, CE010, CE017, CE018, CE024, CE025, CE029, CE030, CE037, CE038)

5. A Complete Set of Mercury Service Manuals (all motors).

6. A Complete Set of Mercury Service Part Manuals (all motors).

7. A Complete Set of O.M.C. Service and Parts Manuals (all motors).

AUDIO-VISUALS

1. Mercury Service Charts.

2. O.M.C. Service Charts.

3. O.M.C. Film & Cassette Tapes Programs.

4. Mercury Film & Cassette Tapes Programs.

5. Sight and Sound Tape and Cassette Program including Special Viewer and Portable Cassette Player.

PROFESSIONAL ORGANIZATIONS AND SUPPORT SERVICES

PROFESSIONAL ORGANIZATIONS

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional, and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

BOATING INDUSTRY OF AMERICA (BIA)

MARINE MANUFACTURING ASSOCIATION (MMA)

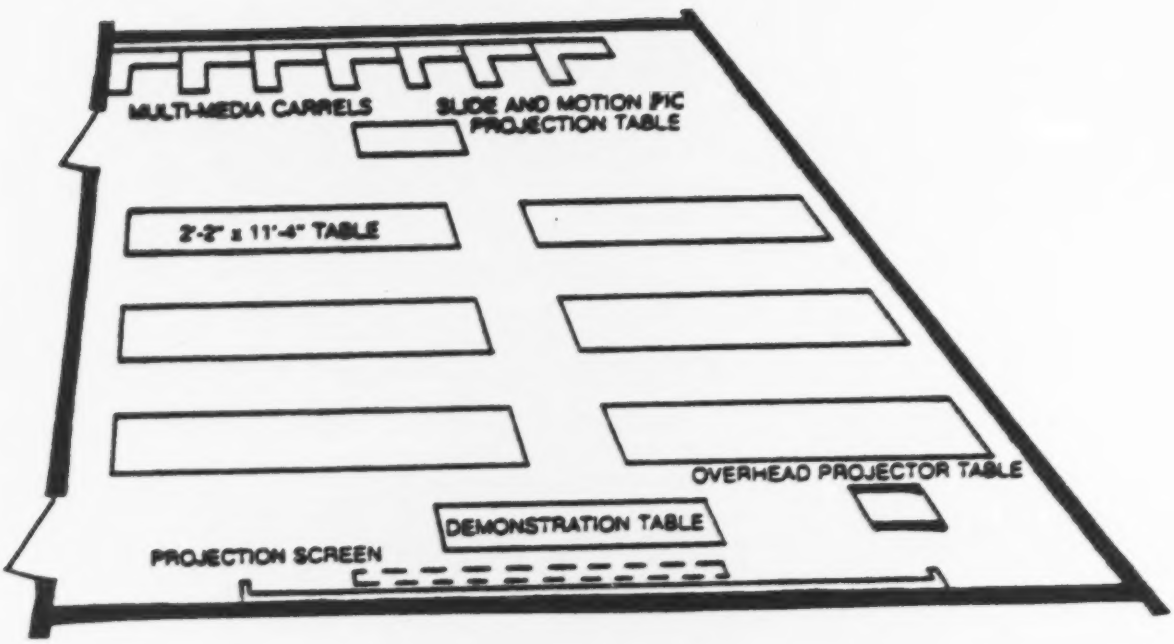
FLORIDA VOCATIONAL ASSOCIATION

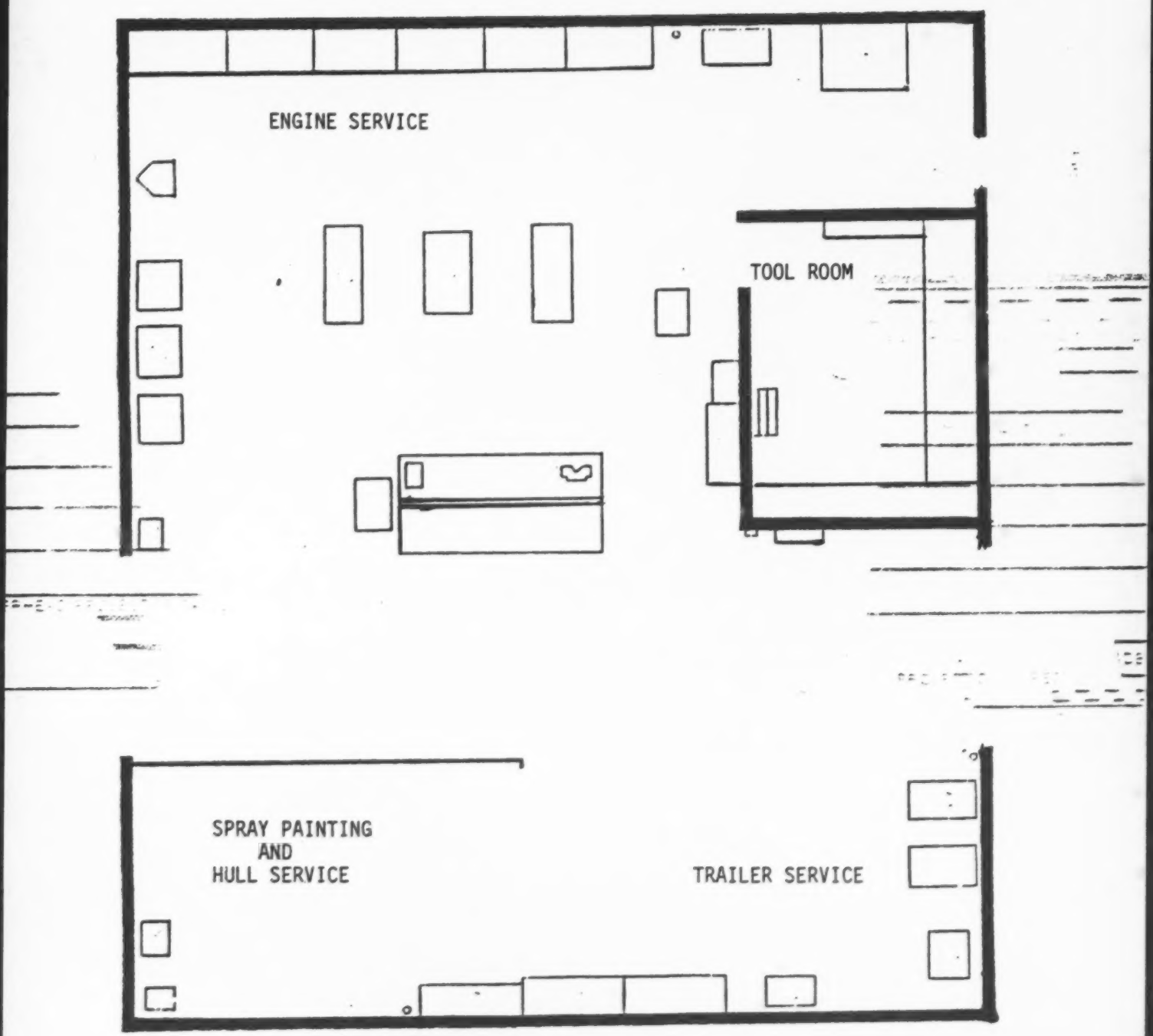
FLORIDA ASSOCIATION OF TRADE AND INDUSTRIAL EDUCATORS

APPENDIX A

FACILITIES DIAGRAMS

SUGGESTED LAYOUT FOR A CLASSROOM

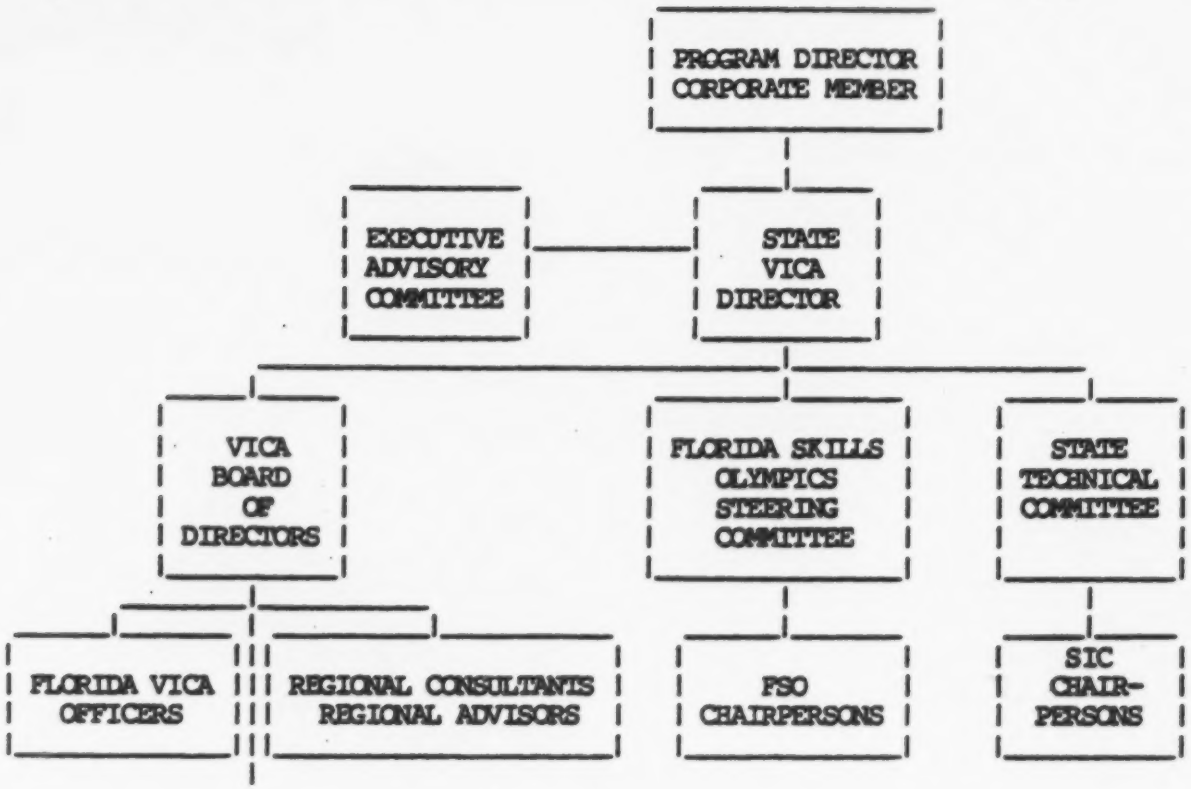




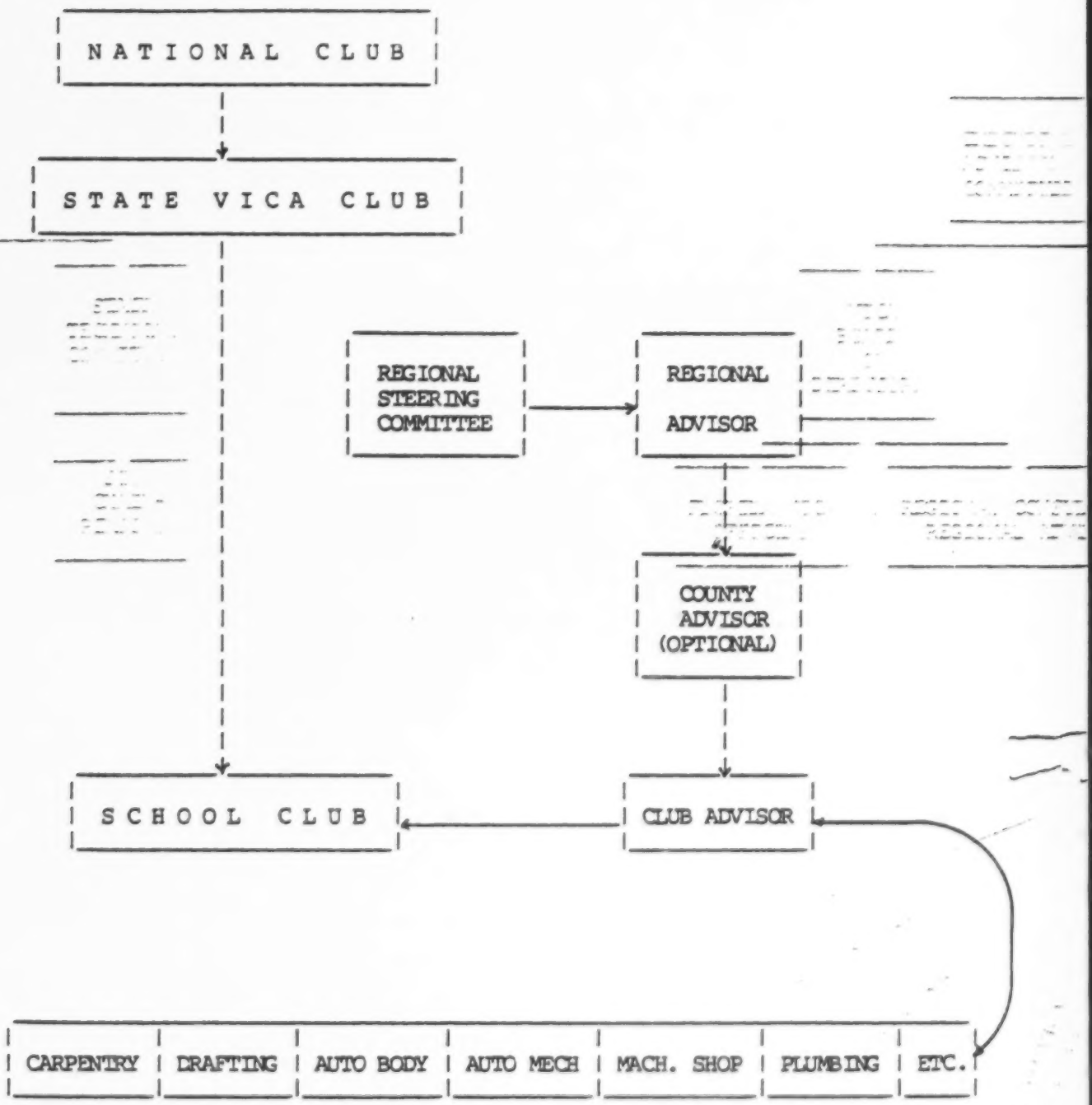
MARINE MAINTENANCE SHOP LAYOUT
APPROXIMATE SIZE 60' x 50'

APPENDIX B

VICA ORGANIZATION CHART


PROGRAM DIRECTOR
CORPORATE MEMBER
EXECUTIVE ADVISORY COMMITTEE
STATE VICA DIRECTOR
VICA BOARD OF DIRECTORS
FLORIDA SKILLS OLYMPICS STEERING COMMITTEE
STATE TECHNICAL COMMITTEE
FLORIDA VICA OFFICERS
REGIONAL CONSULTANTS REGIONAL ADVISORS
FSO CHAIRPERSONS
SIC CHAIR-PERSONS

I
II
III
IV
Members
Club Officers
Section Advisors
Club Advisors
Regional VICA Officers
Regional Advisors
Regional Steering Committee
State Executive Board


NATIONAL CLUB
STATE VICA CLUB
REGIONAL STEERING COMMITTEE
REGIONAL ADVISOR
COUNTY ADVISOR (OPTIONAL)
SCHOOL CLUB
CLUB ADVISOR
CARPENTRY
DRAFTING
AUTO BODY
AUTO MECH
MACH. SHOP
PLUMBING
ETC.